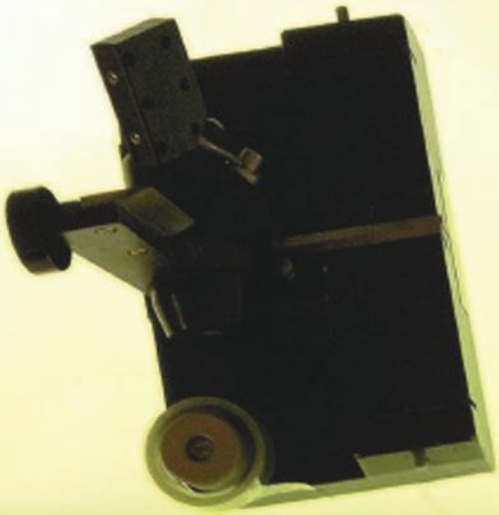
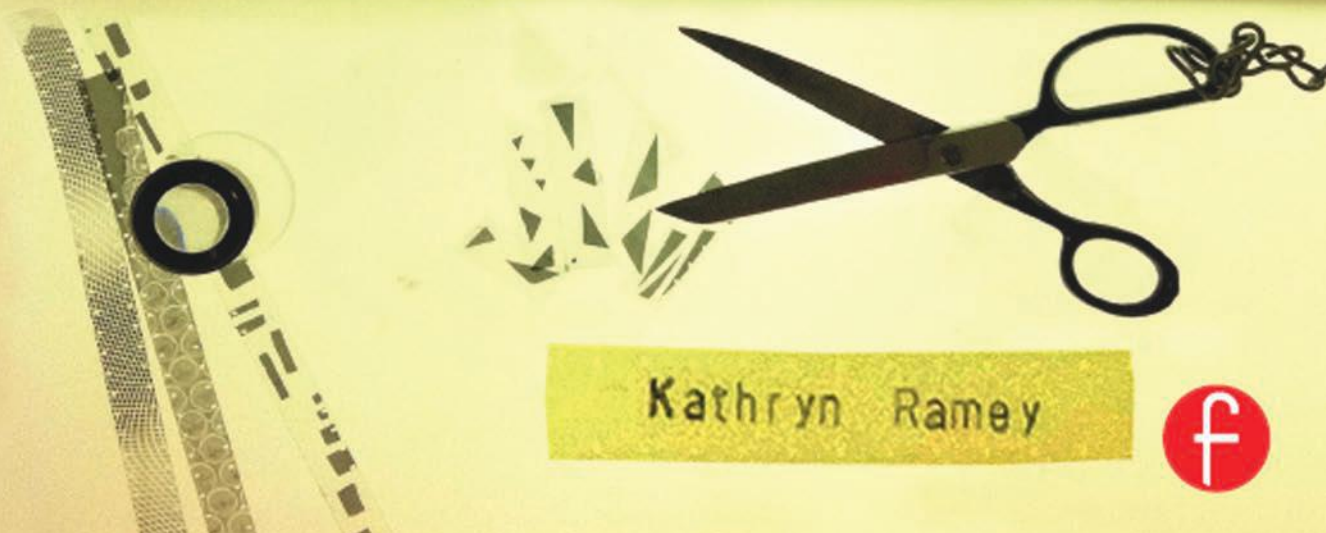
EXPERIMENTAL FILMMAKING

BREAK the MACHINE





Kathryn Ramey

Experimental Filmmaking

Break the Machine

Become a master in the influential, diverse, and highly innovative field of experimental filmmaking. Harness the little-known techniques and subtle aesthetics required for this imagination-driven art form.

For the first time in a single volume, Kathryn Ramey has written a thorough, hands-on guide to the craft and processes of experimental filmmaking, showing you step-by-step the material methods that will help you begin an experimental media practice. From these lessons, following the tradition of Stan Brakhage's *A Moving Picture Giving and Taking Book* and Helen Hill's *Recipes for Disaster*, you'll learn to take materials apart and put them together in new ways, use products for purposes other than those intended by their manufacturers, and free yourself from the constraints of conventional media. *Experimental Filmmaking* provides:

- Full-color film stills and illustrations demonstrating various experimental filmmaking techniques
- Step-by-step tutorials on hand-processing motion picture film, direct animation methods, optical printing, making your own microphones and other sound experiments, glitch art, and much more

- Explanations of the historical, theoretical, and socio-political backgrounds of various experimental filmmaking movements and styles
- Advice on how to locate experimental filmmaking communities in your region, as well as how to show and distribute your work
- Sidebar interviews with filmmakers currently working in the genre that offer context and direction for your own projects
- A companion website (www.focalpress.com/cw/ramey) featuring video examples from numerous films for inspiration and emulation

Whether you're an aspiring experimental filmmaker or mainstream practitioner who wants to incorporate alternative techniques in your films, *Experimental Filmmaking: Break the Machine* gives you the tools you need execute your most daring cinematic endeavors!

Kathryn Ramey is a filmmaker and anthropologist whose work operates at the intersection of experimental film processes and ethnographic research. Her award-winning and strongly personal films are characterized by the manipulation of celluloid, including hand-processing, optical printing, and various direct animation techniques, and have been screened at film festivals and other venues around the world. Kathryn is an associate professor of filmmaking at Emerson College's Department of Visual and Media Arts in Boston, MA.

"Kathryn Ramey's *Experimental Filmmaking* is many things at once: a homespun, one-on-one personal primer (like Stan Brakhage's pioneering *Moving Picture Giving and Taking Book*); a plainspoken 'how to' technical manual (like Lenny Lipton's essential books of the 70s); a compendium of interviews with a variety of experimental filmmakers about their practice and process (like Scott MacDonald's invaluable *A Critical Cinema* series); and a celluloid cookbook, very much in the spirit and letter of Helen Hill's *Recipes for Disaster*.

Both retro (including—at long last—a perfectly realized JK optical printer manual) and au courant (digital glitching techniques, etc.), *Experimental Filmmaking* most of all celebrates and encourages creative adventure with alternative approaches to filmmaking, and offers us recipes, roadmaps, directions, and countless helpful hints as to how to create your own alchemy. This very useful and engaging book of sprocketed (and pixeled) revelations has arrived on our doorsteps, seems to me, right on time . . .

I Second That Emulsion! Back to the Future!"

—Phil Solomon, Professor of the Film Studies Program at the University of Colorado at Boulder, "Ye Olde Cine-Alchemist"

Experimental Filmmaking

Break the Machine

Kathryn Ramey

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Acknowledgments

You may want to skip this if you are in a hurry, but please come back to it at some point, because real acknowledgements, where someone says "Thank You" to all the people and institutions that helped them get where they are, help to contextualize where the work came from. They are never complete, of course, and are often open to the willingness or awareness of the individual writing the book to actually list all their influences. Because this book is over two decades in the making, my list will be long. Because I tend to think of things in a very global fashion, I will digress. But as radical as this text is in terms of personal expression and free will, I also believe very strongly inasmuch as I'm capable in recognizing and giving credit where it is due.

This list begins with my parents and grandparents. Oh sure you say, everybody thanks them. But seriously, my grandparents on both sides were manual laborers who worked tirelessly all day and then came home and worked all night and weekend growing vegetables, canning food, fixing things, making things. My father too. He took apart the carburetor on our car when I was a kid and I got to help. Both he and his mom were crazy shutterbugs taking tens of thousands of slides and many rolls of Regular-8 film. They both were outdoor adventure nuts, climbing mountains with us and hiking and skiing, and were hardcore DIYers and composters and recyclers long before it was cool. They made me a handy, stubborn, image-loving fool. So for that, I thank them.

Then there were my faculty, friends and people I was totally impressed by but terrified of at Evergreen State College in Olympia, Washington. I went there from 1987 to 1991 and, yes, I knew Kathleen Hanna and Tammy Rae Carland and Calvin Johnson but they didn't know me. I watched all of the riot grrrls from afar. They were so crazy and so brave and so loud and I just wasn't. But the lessons they taught, that you can be anything you want, do anything that you want, write a BOOK if you want stayed with me. I guess I just wasn't as ready then as I am now. Some of us are late bloomers.

I did have two really good friends there who started me on this path towards experimenting with film. One was Robin Cline. We are still friends though I haven't seen her in years, but the first time I hand-processed motion picture

film (Super-8 Ektachrome) was in the kitchen of her little house in Olympia. She shot film that ended up in my first truly experimental film *Story of Sarah* (1992 and 1998), distributed by Filmmakers Cooperative if you're interested (www.film-makerscoop.com).

The other influential person from this period was Jason Boughton, who was passionate about all kinds of alternative film practice from ethnographic film to art cinema and everything in between. Together with another friend, Rex Ritter, we started a film exhibition series called Pinhole Cinema Project at 911 Media Arts Center in Seattle, Washington, after graduating from Evergreen. This was where my real education in experimental film began as we programmed work that we wanted to see in a very eclectic fashion. This is how I met Su Friedrich, Peggy Ahwesh, Mike Hoolboom and Craig Baldwin, and where I first saw the short films of Peter Greenaway and works by Hollis Frampton, Abby Child, Carolee Schneemann and Leslie Thornton.

After a while I moved to New York. I worked on a film by Yvonne Rainer, *MURDER and Murder*, and one by Su Friedrich, *Hide and Seek*. Each of them wrote a letter of recommendation for my application to Temple University to study Film in its MFA program. So I owe them a hearty thanks as well. At that time Temple was predominantly a narrative and documentary program, and I always felt like some strange flower they had found growing in their backyard. They didn't plant it, but they watered it just the same, nurturing me as a filmmaker and encouraging me even though my work was dramatically different than what most students were making. In particular Rita Kosen (the department secretary) and Frank Sauerwald (the department equipment repairman) were hugely encouraging to me. The former because she just *believed* in me uncritically and the latter because he lent me whatever weird equipment I needed that couldn't be found in the cage (a matte box, strange lenses and filters) and allowed me to take home the broken JK optical printer and tinker with it until I got it working. This was how my love affair with optical printing really got off the ground and it would never have happened if he hadn't given me the tools (against cries of protest and favoritism by my peers, I'll admit).

During my time there I studied with Lynne Sachs, who was a visiting scholar, and took classes from Coco Fusco, who taught Art History. I also took classes with anthropologist Jay Ruby and somehow managed to go on to get a PhD in Anthropology after my MFA in filmmaking, with him serving as my mentor. He encouraged me to write about the community of experimental filmmakers for my dissertation and supported me the whole way. In a way this book is a not-very-well-disguised ethnography of the experimental film community as it demonstrates the "research" I've been doing for over twenty years into its rituals, practices and opinions.

Temple University is also where I met the person who would become my life partner, Ken Winikur. He is also a filmmaker, though of a distinctly different stripe. Check out his website, www.winikurproductions.com, if you want to know more. But suffice it to say, he and his parents Ilene and Dave Winikur,

and now our children Amiel, Zev and Noam Ramey-Winikur, have supported, cajoled and suffered (through) my growth as a filmmaker, scholar and educator. Ken has endured film being hung to dry all around our house and helped move more flatbeds and film gear than he'd have liked. The kids have been in my movies, shot their own movies and hand-processed film with me. And they have all put up with me as I wrote this book in fits and starts.

Lastly, I'd like to acknowledge the support of my colleagues, the administration and my students at Emerson College where I am an associate professor in Visual and Media Arts. In particular, my colleague Robert Patton-Spruill who introduced me to the acquisition editors at Focal Press, who commissioned this book and who have patiently waited the four years it has taken to come to press. I would like to thank my colleagues Robert Todd and John Gianvito for their support of my experiments in the classroom and in my own films, and Jan Roberts-Breslin who, though she may not know it, has been a great role model and encouraged me to keep working on this book even when I was feeling low.

Finally I need to thank those people who continue to inspire, challenge and amaze me, my students. In particular, Billy Palumbo, my research assistant and copy editor, who went out filming with me in the bitter cold, put up with reviewing multiple drafts of this text and other thankless tasks, and almost never makes fun of my poor punctuation and convoluted writing. Matt Shanafelt, who designed the first iteration of the cover of this book without being asked, just because he felt like it, and Zoe Mylonas and Karen Gerofsky, both of who worked with me at various times scanning images. And to all those riot kidsss sitting in my classroom, who bravely swim upstream, fighting the rapids of conformity to find their own individual expression. I will leave you with some of their thoughts about what experimental/avant-garde media is. They say it better than I could.

FROM VM305—EXPERIMENTAL MEDIA HISTORY/THEORY, SPRING 2014

Mitch Ball, Emily Bateman, Katherine Blye, Sadie Bonang, Steve Cameron, Maisy Clayton, Andy Cox, Kaare Erikson, Balise Gritsche, Tyler Gilbert, Ben Goldman, Evan Gooden, Javier Jimenez, Adam Kaplan, Kristen Klein, Kevin McCarthy, Matt Shanafelt, Zack Sharf, Jody Steel, Natalie Ware, Daniel Whooley, Mark Woit.

What is experimental/avant-garde?

- INNOVATION—is psychological—it is innovative in how it makes you think/feel.
- INNOVATION—is technological—new ways to use old tools, old ways to use new tools, how do we think about tools?
- (Promotes) active viewership.

- (Experience is) subjective.
- Non-normative presentation.
- Importance of place—geography is political.
- Driven—opinionated—willing to take risks to prove point.
- Explore vocabulary of medium to do something only possible with that medium.
- Medium is important—technology IS NOT apolitical.
- Sometimes abstraction is necessary to make a point.
- Does not take technology for granted.
- Stimulates awareness of cinematic experience.
- (Tries to be) free of commodification, cultural fetishism and alienated labor of mainstream media.
- Postmodern and pragmatic movement (even if the individuals aren't always themselves).
- Attempts to show what dominant structures keep hidden.
- Speaks to you as individual.
- Unbounded form of visual expression.
- Exploring specific concepts (not story).
- By nature is in opposition to institutional structures although it is institutionalized.
- Individual filmmaking experience as much as individual viewing experience.
- Oppositional to dominant forms, modes of thought, modes of production of its time.
- Uninhibited.
- Ideological.
- Revolution is ongoing . . .

BREAK THE MACHINE.

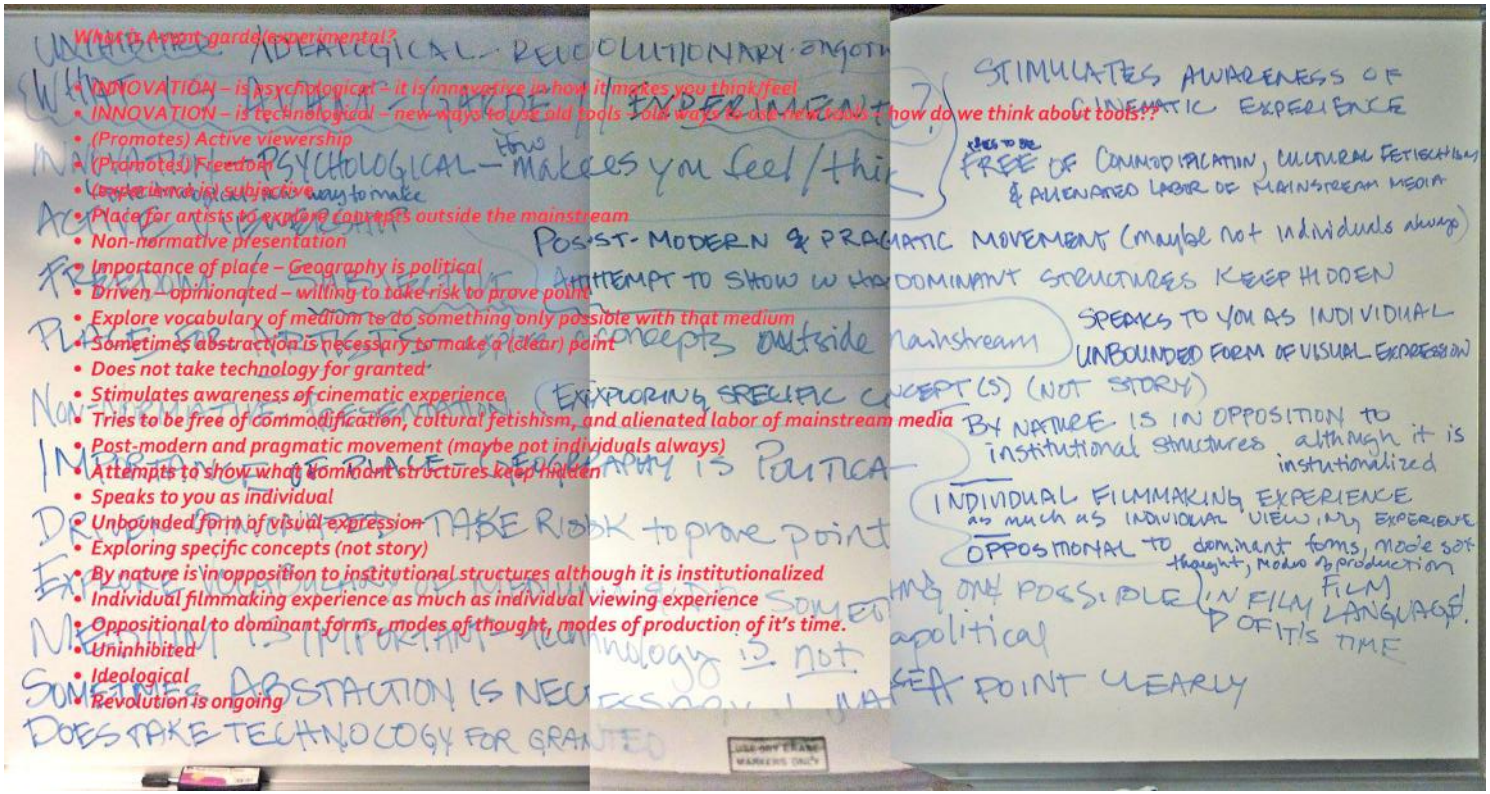
What is Avant-garde/experimental?
• INNOVATION – is psychological – it is innovative in how it makes you think/feel
• INNOVATION – is technological – new ways to use old tools / old ways to use new tools / how do we think about tools??
• (Promotes) Active viewership
• (Promotes) Freedom
• Experience is subjective
• Place for artists to explore concepts outside the mainstream
• Non-normative presentation
• Importance of place – Geography is political
• Driven – opinionated – willing to take risk to prove point
• Explore vocabulary of medium to do something only possible with that medium
• Sometimes abstraction is necessary to make a (clear) point
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FIGURE 0.1
What my students think experimental/avant-garde means.

Introduction

In the common-sense version of European art history it is said that, once photography took over the duties of verisimilitude, painters were free to explore their medium in unprecedented ways. Hundreds, possibly thousands, of books have been written exploring the aesthetic, social, economic and political rationales behind the advent of modernism in art but, suffice it to say, once painting had been freed of the job of representationalism, painting really could be about painting.

It is really much the same with celluloid. If you've followed conversations around film as a medium for the past thirty years and particularly with the advent of HD technology you will have picked up that film is DEAD, obsolete, replaced by video and digital technology ever more precise at rendering sharp images with unending depth of focus. Celluloid has become a niche market, catering to those who value the "quality" of its image and those who appreciate it as medium for other reasons.

As when any medium "dies" in the marketplace there have been valiant attempts to "save" it by hobby practitioners and aesthetes alike. Most recently there was a concerted effort put forth to "save" Kodachrome, a color reversal film manufactured by Eastman Kodak from 1935 to 2009 (and immortalized by the Paul Simon song of the same name) but used primarily in its later days by Super-8mm aficionados and experimental filmmakers. Kodachrome was beautiful but Kodachrome is dead. Kodak no longer makes the film or the patented chemistry to develop it.

Looking beyond the casualties of economic turns in film as an industrial medium, there is reason to be glad about film becoming a boutique and even artisanal format. Following the analogy above regarding painting, film is finally FREE. More and more it is beautifully untethered from any responsibility to portray reality. Its expressive qualities *as film* are being mined not just by artist types but also by the media-industrial machine that once dictated its standards. In other words, the industry is increasingly calling on film to show its own materiality to act *like film* in a context that is more and more filled with digital images.

There is, of course, a downside. Acquiring film and the means to process it will become more difficult and more specialized. In February of 2011 the English artist Tacita Dean, who makes films as installations that are shown in museums and galleries, was distraught to find the last commercial film lab in England had been closed by an American conglomerate that had acquired it. As of the writing of this volume the once-giant Eastman Kodak is facing financial ruin and may close any day. Nevertheless film is still being manufactured around the world and probably will continue to be in some form for a while.

Even after that there will probably be quite a bit sitting around on shelves getting old. I once made a film primarily with stock that was over thirty years old and had been sitting in a news cameraman's closet for at least twenty-nine of those thirty years! This film won an award at a prestigious film festival. There will still be film to draw on and scratch on for decades to come. So don't cry in your soup about the death of film. Celebrate that we live in a world that makes such interesting trash for us to scavenge!

Anyway, this book isn't just about film, although the passage of film from a medium whose main purpose was commercial to one that is mainly used by artists and DIYers (do-it-yourself) is instructive. The reason this book is subtitled *Break the Machine* is because it is about repurposing technology, be it silver-based, analog or digital image and sound tools and processes, for artistic expression. In doing so you are participating in a grand human tradition of imaginative use of debris that began when our ancestors, trying to make their rock axe sharper, looked at the flake that had come off of one big rock that they had just hit with another big rock and said, "Hey, I can use that to cut with!" The scraper was born. Humans are natural recyclers. Only very recently in geological time has our capacity to manufacture significantly outpaced our willingness to repurpose. With trash islands swirling in the Pacific Ocean it is time for us to find a use for our debris (including old media), before it consumes us.

Within art and music the practice of taking something and repurposing it can be seen in everything from the assemblages and *objets trouvés* (found objects) of European Dada to contemporary music. Sometimes this process is engaging in cultural critique and sometimes it isn't. But it is always appropriation. This book is about taking things apart and putting them together in new ways. It is about using things for purposes other than intended by their manufacturers. It is about freeing yourself of the need to make something "perfect" or "beautiful" and just making. The author of this book firmly believes that art is not just on the wall of the museums or on the screen at the multiplex; it is also within the creative capacity of every one of us. Furthermore, the best part of making art is making it. So let's go!

(OOPS, ONE MORE THING) HOW TO USE THIS BOOK

Linear progression from the beginning to the end of this book is not necessary. The book is designed so that each chapter is fairly self-sufficient. In other words, while you *may* apply knowledge gleaned from one chapter conducting the experiments introduced in another chapter, it isn't *necessary*. In some cases additional information may be required for the novice user. I have tried whenever possible to direct the reader to sources outside the text to facilitate his or her acquisition of skills.

Because I didn't learn everything in this book on my own, at the end of every chapter I provide a bibliography of resources to learn more about whatever was covered in that chapter. This will include readings, movies, works of art, music or sound that I found instructive when I was thinking about the way to do the things I just taught you how to do. A book, even a textbook like this, should function like one node in an endlessly expanding network of possible options. I'm giving you places to start, but it's up to you to choose your path.

And, finally, because this book's primary purpose is to *inspire* I have included interviews with *actual living people* who make stuff (we might call it art, or experimental film, or digital-based communicative acts or . . . you get the idea). Each chapter will feature one or more interviews with individuals who practice some form of the techniques discussed in that chapter. The interviews focus on how the artists came to their craft, where they like to see their work, and the community or communities of artists that they inhabit. Each person was selected because not only do I think they will inspire *you*, but they also inspire *me*. Some of them are a lot older than me and some of them are a lot younger than me but I came to know all of them through this crazy social network of film festivals and academic conferences and friends that intersect with what, for lack of a better or more complete term, I call the *experimental film community*. I have also asked that each artist give you a gift, a project or assignment or recipe that comes straight from them. Following Marcel Mauss, for these gifts to have meaning, you need to make something and set it free within the network of exchanges that comprise the experimental film world.

CHAPTER 1

Film-destroy

Even if they stop manufacturing film tomorrow, the world is full of already shot film in a multiplicity of gauges that has been abandoned, thrown on the trash heap and is ready for you to repurpose and make into a piece of art. You may use a piece of found footage because it has a kind of inherent beauty that you want to use as the building blocks for your movie. You may use a piece of film because it has content either visual or aural that you want to repurpose either to highlight what the film is doing overtly or to comment on what you see as its subliminal message or the hierarchies of power that you may feel the film supports. What I mean by subliminal message is the message(s) behind or underneath the overt "text" of the film—the message behind the message. What I mean by hierarchies of power is anything that you see in broader culture, sexism, racism, homophobia, transphobia, ageism, etc., that helps to keep some people in power, making decisions and hogging all the resources and keeps other people feeling like they have little impact on the way things go and without enough money, food or freedom. There are many great found-footage collage films from the history of cinema that set a precedent for the repurposing and redirecting of found footage. Some of these are politically charged and critical of the mass media from which they draw the material with which they are made. Some artists make use of found footage as a textural element. The title of this chapter is called "Film-destroy" because in order to make a new work all collage films have to cut up another film or films. In addition, this chapter will discuss other techniques of deconstruction that have been employed by filmmakers such as bleaching, scratching, baking, rotting, molding, boiling, cutting up and gluing.

Before we begin to look at destructive techniques used with found footage I want briefly to introduce you to the theories and histories associated with its most radical use. Most of the time film that was shot by someone else and repurposed is called "archival film". Archival film usually comes from archives where it is catalogued according to location represented, content, who shot it, where it originally was used and so on. When a filmmaker uses found footage in this way they call it "archival" and it is used as proof of this or that historical occurrence, or to reference a place or time or person. In other words in general

it is used entirely uncritically of its status *as an image*. When footage is used like this it is most often without any substantive critique of the content or the media being used, or the corporate machines and/or patriarchal nationalist regimes it is used to shore up. It is used as *proof* of something that the filmmaker believes really happened or to indicate a "there-ness" or a "then-ness" for a story that the filmmaker is telling. An entire industry in the form of archival houses has emerged to support the mainstream media's need (feature film studios or television) for this kind of material. In addition, almost all studios and networks keep their own archives of their materials and charge a pretty penny for its use in other people's projects.

The business of an archive is to collect and catalogue media according to *type*. Then when someone is looking for, say, images of Mt St Helens erupting in 1980 or the riots in LA in the 1990s or Barack Obama's acceptance speech, someone has it somewhere exactly how they want it. The United States even has a national film archive where all kinds of footage are catalogued and preserved including home movies. The point of me talking about archives and the ways in which the majority of filmmakers use them is that most filmmakers who use archival footage use it as a document, proof of the thing they are trying to illustrate without any real analysis of its status as an image. In contrast, when most experimental filmmakers use found footage at the very least they are engaging in the artistic process called *assemblage*, which here means putting together media used in other contexts to create a new meaning. In addition, many assemblage filmmakers are working to subvert the dominant paradigm, the hegemonic discourses present in the unholy triad of media, state and civil society institutions. At least that's what they hope for. For an excellent analysis of the difference between archival footage and the avant-garde use of found footage, particularly in the work of Craig Baldwin, please read Michael Zryd's essay "Found Footage Film as Discursive Metahistory: Craig Baldwin's Tribulation 99".

So, what specifically am I talking about? Well the idea of the artistic use of the found object in modern art really goes back to those crazy Russian and European avant-gardists from the early 1900s. Assemblage is the artistic practice begun in various modernist art movements of the 20th century of taking a found object (*objet trouvé*) and using it as a part of your work of art. Dada artist Marcel Duchamp took this idea so far that he began exhibiting the objects themselves. Coined "ready-mades" his most notorious work was to exhibit a signed urinal titled *Fountain* and signed by one of his many aliases, "R. Mutt". The custom of using material objects from the everyday world became a part of artistic practice throughout the 20th century and continues to this day.

Born in Queens, New York, and living his entire life with his mother and ailing brother, American surrealist artist Joseph Cornell was one of the film artists to use this idea of assemblage and cross over into film. Cornell is, of course, most famous for his "boxes", beautiful sculptures created sometimes in homage to a screen siren he was enamored with such as Lauren Bacall (e.g. *Untitled*—

Penny Arcade Portrait of Lauren Bacall, ca. 1945–1946) in which he used cuttings from movie magazines and other objects. Cornell was an obsessive junker. He trolled the pawn shops and junk stores of his day and picked up all kinds of materials, movie magazines, films, records and objects that he would use in his work. He made a number of short films from editing together this found footage but his most infamous contribution to the field was only briefly seen in the early days of cinema and then scuttled for decades. In 1936 Joseph Cornell premiered his found-footage collage film *Rose Hobart* in a New York art gallery (Figure 1.1). Cornell had taken the feature film *East of Borneo* starring Rose Hobart and taken selects, mostly the shots containing the actress, and re-edited them. When he screened it he would put a blue glass filter over the lens, show it at 18FPS (silent speed) and play it with two songs from Nestor Amaral's album *Holiday in Brazil*. Both the album and the film had been purchased from a junk shop. At a screening the film so upset Salvador Dali (one imagines it was because he had not thought to make such a film first) that he knocked over the projector and accused Cornell of stealing the idea from his dreams. Cornell was so disturbed by this outburst that he refused to show the film again until he was coerced to do so in the 1960s by filmmaker and avant-garde champion Jonas Mekas.

American artist Bruce Conner is best known among cineastes as a filmmaker but he also produced assemblage sculptures, including *Arachne* (1959), which resides in the Smithsonian Museum of American Art in Washington, DC. The piece is a collage of thickly woven women's stockings and other found material. It was Conner's artistic practice of working with media objects as well as his

FIGURE 1.1
Film still of Joseph Cornell's *Rose Hobart* (1936).

interest in photography and critiquing media culture and the systems of oppression it supports that brought him to using cinema. Bruce Conner's 1958 film *A Movie* has become the classic example of found-footage collage in which the media is reused to critique mass media's impact on American culture and society. Conner's film *REPORT* (1964) reworks the film of the John F. Kennedy assassination that he filmed off of the television. The film critiques the way in which the media, by repetitively screening the footage of the event, was benefiting by turning the tragedy into a spectacle. New York filmmaker Ken Jacobs's epic *Star Spangled to Death* (1960, 2004) combines staged scenes with legendary performance artist Jack Smith among others with found footage that, as Jacobs himself attests, "pictures a stolen and dangerously sold-out America, allowing examples of popular culture to self-indict" (Jacobs 2014). This repurposing was never considered plagiarism by the artists, rather, a strategy for attacking dominant culture by repurposing its own weapons (media).

French filmmaker and philosopher Guy Debord founded a political and aesthetic movement called Situationalism in which *detournement* or "turning expressions of the capitalist system against itself" (Debord 1983: 207) was a central technique. Debord's feature-length film *Society of the Spectacle* (1973) was composed entirely of found footage from fiction and non-fiction films. US filmmaker Craig Baldwin was inspired by Connor, Debord and Situationalism, and made several collage films including *Wild Gunman* (1978), *RocketKitKongoKit* (1986) and *Tribulation 99: Alien Anomalies Under America* (1991) that used extant fiction and non-fiction films to make hilarious paranoid rants that simultaneously mirrored the discourse of the cold war and American imperialism and criticized it. Baldwin calls this technique of using the tone of the conservative political regime in critiques against it as "point right and go left". This is a technique also employed by various punk rock artists. One of the earliest of these, Jello Biafra of the band the Dead Kennedys, wrote a number of songs such as "Kill the Poor", "Holiday in Cambodia" and "California Über Alles" that used the language and tenor of the far right to critique it. All of these artists not only critique the way in which media creates a passive consuming subject but also activate the viewer to recognize their own passivity in viewing.

> Jane Fonda on the screen today
> Convinced the liberals it's okay
> So let's get dressed and dance away the night
> While they: Kill kill kill kill kill the poor: tonight
>
> **"Kill the Poor" (1980) by Jello Biafra and East Bay Ray (writers) and the Dead Kennedys**

Using found footage as a means to critique dominant culture and the media industry that supports it has become a strong facet of the film avant-garde. As we go through various destructive techniques that can be used of found footage you will also see how artists have used these techniques to subvert the intended message in the media they are manipulating.

FIGURE 1.2
Still from Ken Jacobs's *Star Spangled to Death* (1960, 2004).

SCRATCHING AND CUTTING

The most basic intervention you can make into a film besides editing is scratching. Normally we try to avoid scratching the surface of the film. Scratches are seen as mistakes or worse. But early on in filmmaking artists started to acknowledge scratches as interesting marks on their own. In *Fireworks* (1947) Kenneth Anger used scratching on film as a means to draw a halo around a character. Stan Brakhage used scratching in his early live action work as well and would go on to experiment with all kinds of surface manipulation, scratching his signature "by brakhage" at the end of most of his films and creating entire series of films that were primarily abstract scratching. Len Lye's film *Free Radicals* (1958) is a film created with abstract scratching that is made to sync with a song by the Bagirmi tribe. In *Blinkity Blank* (1955) Norman McLaren created a more representational film about a bird and its cage by scratching directly on 35mm celluloid.

In Cathy Joritz's *Negative Man* (1985) a film of a man giving a sermon is disrupted by the artist scratching directly into the emulsion. These scratches take the form of symbolic interventions into his masculine authority as he is alternately given a pig's snout and ears, a Mohawk, a fish on his head, beams streaming from his eyes and other mutations. These alterations serve to undermine the authority of the speaker and serve as a metacommentary on the authority certain kinds of men feel they have to tell the rest of the world what to do. Joritz calls the film "humorous vengeance" and says she is scratching her commentary directly into the celluloid (Joritz 2015). Another Joritz scratch film, *Give AIDS the Freeze* (1991), conveys messages about the importance of safe-sex practices scratched over a rather banal image of two men talking. In this film messages such as "Guys don't forget the condom" are etched directly onto the 35mm film, which is then rephotographed on an optical printer.

In *Two Sisters* (1991) Caroline Leaf etched figures and scenes into 70mm black light-struck celluloid. She explains on her website that she digs into the soft emulsion side of the film with a variety of tools. Because the film is color, the

FIGURE 1.3
Cathy Joritz's *Negative Man* (1985), Eye Light Beams.

FIGURE 1.4
Caroline Leaf at work on *Two Sisters* (1991).

dense black isn't really black, but is actually the three layers of emulsion that comprise color film. So when you carve through it various colors are revealed, mostly yellow and green. It also appears as though Leaf painted directly on the film in a key sequence where a man who visits the sisters cuts his finger and blood fills the frame. Color was added during the printing process in the swimming sequence so that the black areas appear blue. Leaf uses a registration plate with a light box that appears to be specially made for her purposes so that her images gradually reveal themselves to her as she cuts into the film.

These are only just a few of the examples of how scratching or etching into the surface of film has been used by filmmakers. Other filmmakers have used blades and punches to cut out sections of the film frame. Sometimes these punches and cut-outs are inserted into other sections of film. In *Girl from Moush* (1993) Gariné Torossian cuts out Super-8mm frames, of what look like family images and home movies, and inserts them into a 16mm frame that has a cut-out of relatively the same size. She also cuts strips of 16mm vertically and then tapes that onto the film. She does this as a way to represent the fractured reality that is her family's relationship to their lost homeland, Armenia.

Luther Price's *Sodom* (1989) uses found Super-8mm hard-core male-on-male pornography as its source material to retell the biblical story of the doomed city. The film is altered using hole punches and awls to take out images that

FIGURE 1.5
A frame from Lauren Cook's film *Altitude Zero* in which part of the 16mm film frame has been cut out and another image inserted. Held in place by tape.

FIGURE 1.6
An image from *Altitude Zero* in which the text is scratched on the frame.

are taped back into other areas. Heads spin around and mouths are gouged out. For many viewers it is a very graphic and disturbing piece but the animation technique is quite stunning.

Lauren Cook's film *Altitude Zero* (2004) is an exuberant exploration of found-footage collage, cut-out, painting and dyeing the film. The film is both a celebration of Amelia Earhart's achievements and a criticism of the way that women are objectified and participate in that objectification in American history. Shots of beauty pageants and women's bodies being judged while their faces are obscured and beautiful baby contests are interspersed with footage of Earhart. Cook scratches her lamentations directly onto the film, how she wants to be "more like her" (Earhart).

Another example of utilizing found-footage collage is Steve Cossman's *TUSSLEMUSCLE* (2007–2009). Steve collected thousands of View-Master reels that featured flowers. View-Master images were shot on 16mm film and then cut and inserted into their cardboard cartridges. When Cossman discovered this he decided to collect View-Master reels via tag sales, junk stores and online sellers such as eBay and categorize them. *TUSSLEMUSCLE* is comprised of over 7000 individual frames held together with splicing tape and then rephotographed with an optical printer to create a projectable film. A sample of it is available to view on our website.

Steve Cossman describes *TUSSLEMUSCLE* as follows:

> The work presented is a reflection on humanity's ecological relationship and the ritual of restoration. Power is drawn from the colors and forms of the discarded flower image through the use of pattern and rhythm.

FIGURE 1.7
Steve Cossman's *TUSSLEMUSCLE* (2007–2009)—a collection of View-Master flowers.

The violent pulse speaks with a sense of urgency and chaotic struggle while the hypnotic arrangement keeps us in blinding awe to its condition. *TUSSLEMUSCLE* is composed of 7000 single frames, which were appropriated from View-Master reel cells. Each frame was hand-spliced to create a linear film. Jacob Long created the score.

TUSSLEMUSCLE took over three years to make and was an extraordinary combination of abstraction and the rigorous application of organizing principles that began, like Cornell so many years prior, with collection. Cossman collected vintage flower-themed View-Master reels. These reels were originally shot on Kodachrome 16mm, but with a square aspect ratio using a third more film vertically than a traditional 16mm cine frame.

As he had found a significant number of duplicates these were organized into envelopes. He ended up with over 200 different images and with 14 to 240 frames of each image. These were sorted into various envelopes with the image

FIGURE 1.8
A sampling of packaging from the View-Master reels. Courtesy of Steve Cossman.

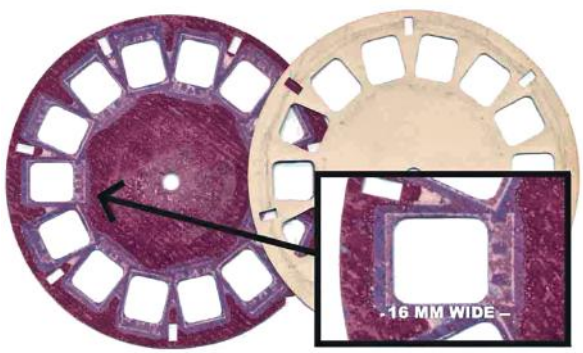

FIGURE 1.9
View-Master films are 16mm wide. Courtesy of Steve Cossman.

on the front and organized. Inspired by musical and numerical patterns he generated a "script" for the process and determined what flower would stand in for what part of the script. Then he began an editing process that was both laborious and extremely structured. Every frame had to have that extra third trimmed and then be spliced to the next frame.

As you can see there is a myriad of really creative work out there that is made by distressing and cutting found footage. There are a number of tools that are ideally suited for this and various artists have their favorites, but at minimum you will need the following supplies.

FIGURE 1.10
Steve's wall of work. Courtesy of Steve Cossman.

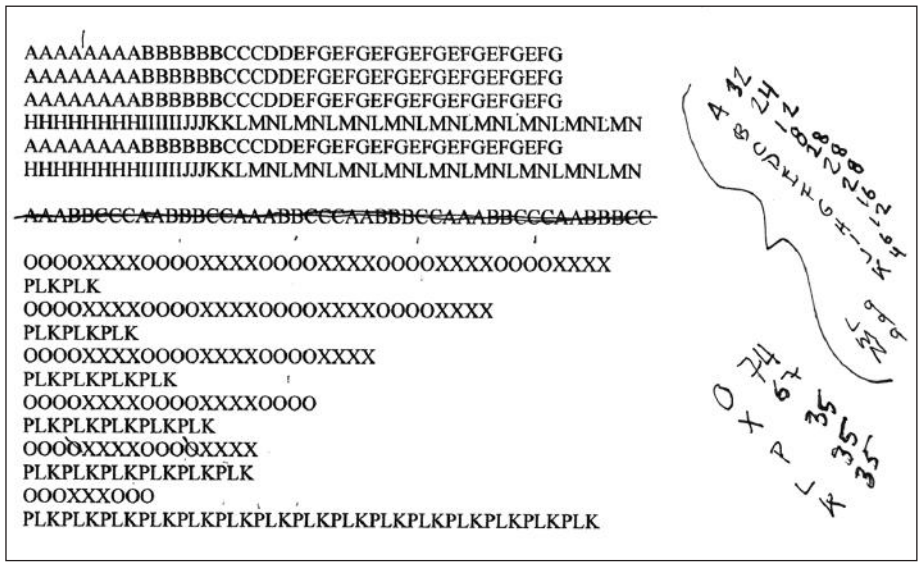

FIGURE 1.11
The score for *TUSSLEMUSCLE* (2007–2009). Courtesy of Steve Cossman.

FIGURE 1.12
Steve's light table with splicer. He trims each frame top and bottom. Courtesy of Steve Cossman.

WHAT YOU WILL NEED FOR FILM-DESTROY

- X-Acto or other blade. X-Actos are good because you can purchase a variety of nibs that can allow you to cut in different ways. Curved blades with practice can be wielded to cut through just part of black struck color film. Because color film is composed of three layers of color, this means you can carve different depths and show different colors. This takes practice! Also, for cutting you will need to change your blade fairly often as film dulls it.
- Small sharp needles or pins. If you go to a fabric store you can pick up a whole box of really sharp pins (used for holding fabric in place while sewing) and/or really thin, really sharp sewing needles. The latter can be a bit difficult to hang on to so it's not a bad idea to embed them in some clay or an eraser to make them easier to hold.
- Hole punches. These come in a variety of sizes and shapes of hole punches including hearts and ones that look like dashes. It is best to get punches in which the dowel (the part that punches) is vertical on the sides and doesn't bend in. The ones that bend in tend to leave rough edges on the punches.
- Tape and tape splicer. There are a whole bunch of different kinds of tape splicers out there and if you are a serious filmmaker you will want to get one. They are frequently available for sale on eBay.
- Fantastic™ or other very alkaline soap. While not as powerful as washing soda (pH 11) soaking your film a bit in Fantastic will soften the emulsion. Spray on a few feet at a time and keep wet with a sponge or mix up a small batch of water and soda ash, and sponge on a few feet at a time. The emulsion will be soft when wet and then harden again when dry.
- A light box or table or some under-lit surface that you can work on and see your film through. There are a number of DIY instructions for how to build your own on the web. When I started working I used a window that received lots of sun for most of the day with a piece of vellum on it! Later I trash-picked a window and a clamp light and, with some bricks, that same piece of vellum, wood and clamps, made my own inclined light table. Now I have a fancy, daylight temp, non-flickering animation table that is more portable and storage friendly.
- Found color or black and white of any gauge (bearing in mind that the larger the gauge the bigger the working surface).
- AND/OR black color or black and white "light struck" film (film that has been developed but is optically dense). It IS NOT painted leader. Emulsion is soft and easy to scrape off. In addition, color film has interesting layers to carve through. This is a great use for all those films that you may have already shot that were underexposed!

Film splicer

It is extremely helpful if you have a splicer for the gauge of film you are using. A film splicer is a device that sutures two pieces of film together. There are three general types of splicers: electromagnetic for polyester-based (Estar) film, glue splicers for permanent splices on acetate-based film, and tape splicers, also for non-permanent editing on either acetate- or polyester-based film. There have been splicers made for all gauges of film manufactured, because, almost from the beginning of motion picture production, films have been shot to be edited. Electromagnetic splicers are very expensive and predominantly used by labs because NO camera stock or workprint stock is Estar based. Glue splicers are predominantly used for negative cutting. If you're going to be working with film it makes sense to get yourself some kind of tape splicer.

Since filmmaking used to be a relatively popular hobby there are plenty of splicers available on eBay or in thrift stores. The two most popular professional tape splicers for 16mm film (also available in 35mm gauge) are colloquially known as Guillotine and Rivas (type). Called a guillotine for the way it cuts the tape after an edit is made (I'll leave it to your imagination) by far the most well-known and used 16mm and 35mm splicers were manufactured by Doctor Leo Catozzo of Rome, Italy (see Figure 1.13). Guillotine-type splicers were also made for Super-8mm and Regular-8mm editing. These can be purchased online from a variety of resellers including Boston Connection (www.cutfilm.com) and eBay. Guillotine splicers use unperforated, clear Mylar tape. As tempting as it is, do not use Scotch tape, because it is thicker and weaker than Mylar tape and won't stand up to being put through a projector.

FIGURE 1.13
A guillotine splicer. To edit film, the tape is clear and unperforated.

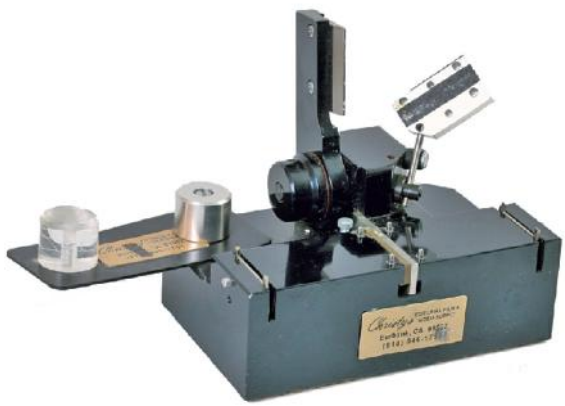

FIGURE 1.14
An Invisio 16mm film and audio butt splicer. It is nearly identical to the Rivas splicer, although a Rivas generally has framelines where you lay the film to aid in finding your splice. Rivas-type splicers use sprocketed tape and it must be cut and applied directly to the film.

The Rivas type splicer (Figure 1.14) uses perforated tape that is laid down over the splice area so as to line up with the sprocket holes on the film. Many people, the author included, find this kind of splicer extremely difficult to use. Other people swear by them. They are slightly more expensive than Guillotine splicers and the perforated tape is three to four times more expensive than Guillotine tape. Proponents of this type of splicer say you use less tape and that the splices are cleaner.

Other tape splicers use press tapes, pre-cut tape strips of sprocketed tape that are easy to apply but extremely expensive. You can also purchase block splicers that have sprockets to line up the film and a groove to cut film at the frameline. These would also require press tapes or sprocketed tape.

THE PROCESS

Once you have all your materials collected you can begin to experiment. In order to scratch the film it must be emulsion side up. You can only scratch into emulsion not base. The emulsion side is usually more matte than the base side of the film. If the film has images you may even be able to see that the images are slightly raised on the emulsion side. Film orientation is important here. Film that is single sprocket will be emulsion side up when the sprockets are on the left. You will want to work top to bottom and left to right for your film to project properly. You will only be able to work on short segments at a time. Sound film is 24FPS, whereas silent is 18FPS. And most projectors only run at sound speed. So to make one second of images you will need to alter 24 frames. A great way to see your progress as you go is to create a loop of 5–6ft of 16mm film and then load it into a slot-load projector. You make a loop by editing the head of the film to the tail.

HOW TO MAKE A FILM LOOP

First, in order to project a film loop you must have a slot-loading projector and a film splicer of some kind. All the major manufacturers (Eiki, Elmo, Bell & Howell) made slot-loading 16mm projectors. These are essential for testing out film loops because you can thread the loop into the projector without having to cut the splice. You can also test a film loop on rewinds with a moviescope viewer or on a flatbed. The length of the loop will be determined by how much film needs to be threaded through the machine in order for it to come back and rejoin itself at the splice.

The easiest way to determine the length that your particular viewing set up will work with is to take some leader, thread it through the system, splice it and then try to get the system to run. You want to try this with leader that you don't care about in the event that it jams or breaks. In all systems, the use of daylight spools or cores will facilitate the loop threading through the path smoothly. Often it helps to put just a little tension on the loop by holding the loop between your fingers. If you have a piece of animation that you want to

test out and it is not long enough for your projector, flatbed or rewind set-up, you can always splice in the appropriate amount of leader to create a length that works.

BLEACH

Ordinary household bleach, also known as sodium hydrochloride or by brand names such as Clorox™, is very good at removing emulsion of all kinds from the surface of film. Concentrated fumes can also irritate the mucous membranes (your nose and throat) and undiluted liquid can burn your skin. Bleach at any concentration will likely remove color from any clothing or even work surfaces and floors. In addition the combination of bleach and ammonia produces a number of by-products that, depending on the concentration of the substances and the mixing temperature, can be extremely hazardous. So if you are experimenting with a variety of chemicals please don't mix them! Unless you have studied chemistry, you don't know what the outcome will be.

In any event, a few simple guidelines during the use of bleach should enable you to keep your hands, mucous membranes, clothes and furniture unscathed. First, it is unnecessary to use bleach at full strength to get it to remove emulsion. It is sufficient to have a 1:2 or even 1:4 ratio with water. This will reduce the intensity of the fumes associated with its use and make it less hazardous if there is an accidental spill. In addition it is a good idea to wear protective gloves (nitrile or powder-free latex or vinyl are fine), work in an area that is easy to clean up in case of spills and has decent ventilation (the bathroom or outside on pavement), and either wear clothes that can get bleached or protect your clothing with a plastic apron. A large trash bag can be appropriated for these purposes in a number of ways. Cut up the sides it forms a large (3ft by 8ft) plastic drop cloth, and with a hole cut out of the top and one on each side it can be a great apron. If you want to be a little more fancy you can purchase drop cloths of various sizes and thicknesses at your local hardware store.

FIGURE 1.15
Still from Naomi Uman's *Removed* (1999).

There are a number of ways to apply bleach. You can create a small dilution in a cup and apply it to film with a paintbrush or cotton swab. If you are interested in a random patterning of spots you can put your bleach solution in a spray bottle and (after laying the film emulsion up on a bleach-resistant surface like a bath tub, the sidewalk or your driveway) you can spray the film. If you are feeling flush, you can buy bleach pens that have a wide nib and can be applied easily without the fear of spilling. However, for the cost of a single bleach pen you can purchase an entire gallon of bleach, enough to use on your laundry, bathroom and film. One caveat: bleach does "go bad" in that it loses its strength over time. I recommend using up your bleach within the year that you purchase it. Again, if you are at loose ends as to how to do so I'm sure there is a toilet or shower in your house that could use a scrub.

If you want to work with more accuracy than the above methods provide you can use a "resist" technique to protect the areas of the emulsion that you do not want to remove. Derived from the ancient technique of batik this is really just applying tape, glue or nail polish to the surface of the film before you apply the bleach. Obviously, whatever you apply must either be see-through and relatively low profile (not bumpy) or be able to be removed after bleaching is completed. Nail polish comes with a ready applicator inside the bottle. It is not a bad idea to buy something with a little bit of color so that you can see where you have applied the nail polish. Bear in mind nail polish usually contains a whole host of nasty chemicals including formaldehyde (a carcinogen) so, despite the fact that billions of women use it, nail polish isn't exactly risk free.

The applicator in the nail polish will probably need to be trimmed down a bit to facilitate more accurate application. If you're looking to create a pattern you can use either Scotch tape or masking tape (the latter is much easier to remove when you're ready to) to tape off areas or create stripes or patterns. You can also use a hole punch to create dots of tape or even use stickers as resist. You can cut tape or stickers into whatever pattern you wish and then apply them to the emulsion side of the film before you bleach. Please be aware that if you are using a film with an optical track (sound) that you want to maintain, you should absolutely tape over that before bleaching of any kind is done.

After your film has been sufficiently lightened it is important to wash off the bleach. Otherwise it will just keep lightening the film and even when dry it will come off on your hands, clothes and other films. It will also make your film more fragile and less pliable. Simply rinsing your film with warm, running water is sufficient to (mostly) get the excess bleach off of the film and to remove the tape or glue if water soluble. If you really want to get rid of the bleach, rinsing it in a mixture of sodium thiosulfate (the main ingredient in most photographic fixers) is the only way to stop bleach completely. This isn't really necessary, as if you want to "preserve" your bleach experiment you will either make a film print of it (for instructions on this see Chapter 3 on optical printing) or transfer it to video. If you are trying to remove nail polish, wash the film and then apply nail polish remover to the areas of resist. Nail polish remover is commonly made of acetone, which is very hard on the skin and can cause

the film to shrink and become brittle if put on in too high of a concentration or left on too long. It is possible to use non-acetone nail polish remover. This takes longer but is more kind to skin and film. After removing the nail polish, wash the film again and let it dry. If your film is particularly brittle you can use some film cleaner or lubricator such as FilmRenew. Do not roll up your film either after washing or after cleaning until it is completely dry. To aid in drying you can use a hairdryer or simply drape the film over a curtain rod or down a stairwell until it dries.

Probably the most well-known example of this kind of nail polish resist with bleach work is a film by Naomi Uman, *Removed* (1999). This film is made up of found footage from two different porno films. The artist applied the nail polish resist to the men in every frame and then bleached out the women. She was careful throughout to protect the optical track so that the sound (badly dubbed English, no less) remained as well. In the finished product men are seen talking to and caressing nothing, a big blank in the screen that nevertheless writhes and moans.

FIGURE 1.16
Students working on film.

FIGURE 1.17
Close-up of resist technique.

Supplies/process for bleach/resist

- Ordinary household bleach and/or bleach pens.
- Film—found footage or black leader.
- Drop cloth or big trash bags to protect work area.
- Apron or big trash bag with holes cut out to protect people and clothes.
- Gloves to protect your hands.
- Nail polish.
- Nail polish remover.
- Cotton swabs.
- Brushes.
- A spray bottle.
- A bucket of plain water or a sink nearby to wash off film when it is sufficiently bleached.
- A hairdryer (to speed drying of film, nail polish, etc.).
- FilmRenew (optional) to soften and preserve film when it is all done.

FIGURE 1.18
Close-up of bleach.

SODIUM CARBONATE/A.K.A. WASHING SODA/ A.K.A. SODA ASH

Sodium carbonate is more commonly used outside the United States as a laundering agent. It is very alkaline with a pH of 11. It is a close relative of baking soda, being just a few molecules removed. In fact, it is possible to turn baking soda into washing soda by heating baking soda in an oven at 400°F. The heat makes the baking soda molecule ($NaHCO_3$) unstable, releasing water in the form of steam (H_2O) and carbon dioxide (CO_2) until you are left with sodium carbonate (Na_2CO_3). However, unless you have an unlimited supply of baking soda and no soda ash available, this isn't really necessary. Where do you find soda ash? Besides laundering it is commercially used to raise the pH in swimming pools. So you can find soda ash either at a pool supply store, the cleaning supply section at a supermarket or hardware store, or at art stores that sell fabric dye as it is often used as a fixative. Like most things, it is also available to purchase online.

Soaking film in a hot water/soda ash solution softens and eventually breaks down film emulsion. Softened emulsion can provide a more suitable surface for scratching the film, but what is most distinct about this process is that within 10–15 minutes of soaking you can have film that appears as though it has been buried in the ground for a year. The emulsion will be eaten away in

FIGURE 1.19
Soda ash distress on color film.

spots, bubbles will form, emulsion will raise up and re-attach to the film in a new place. This creates a very distinct distressed look. The film, even after drying, will require delicate handling so it is recommended that if you distress the film in this way you optically print it soon after. It is also possible to use Revis splicing tape or Scotch tape (being careful not to cover sprocket holds) to re-attach emulsion to the surface of the film.

Supplies for washing soda distressing of film

- Soda ash a.k.a. sodium carbonate a.k.a. washing soda. This usually comes in fairly large packages (8oz or a pound minimum) and is inexpensive. You only need a few tablespoons at a time.
- A portable burner or a stove that your roommates/parents/partners don't mind if you "cook film" on. Really this isn't a toxic solution so they needn't be alarmed.
- A big metal or enamel pot and some wooden utensils and/or tongs to pull out film. Although washing soda isn't toxic perhaps it's best if you go ahead and get a pot you reserve for film now. It will make things easier with parents/roommates/partners when you're finishing up film stuff while they are trying to make supper.
- Access to water in a bucket or sink.
- Film. Black and white or color found footage.
- Splicing table used along the length of the film is good to secure "flaky" emulsion
- A hairdryer or a place where your film can dry undisturbed.

Soda ash works most quickly when it is dissolved in warm water. I have a small burner and a pot purchased at a thrift store that I use to heat up a water/soda ash solution, but if you don't have a burner, just get the warmest temperature out of the tap and stir that water until it dissolves. About a tablespoon per gallon of water should be enough to get you started. You can increase your soda ash amount if you want it to work more quickly. Film is soaked in this solution until the surface becomes soft and/or begins to flake off. You want to watch the film to make sure that it doesn't lose the image altogether. If you have enough film floating around in the pot, some of the emulsion might flake off and re-attach itself to a different point on the film. In any case, once the film is soft and coming off the acetate, remove the strips from the pot and let dry. As the film dries the emulsion can shrink up and crack further. While the emulsion is still wet is a good time to etch into it because soda ash makes it very soft. You can also attempt to lift off sections with clear adhesive tape and then apply them to other areas or to clear leader. If you do this be sure not to cover up the sprocket holes!

LETTING NATURE TAKE ITS COURSE

There are a number of filmmakers who have distressed film simply by either burying the film in the ground (e.g. Louise Bourque), letting it blow around their backyard (e.g. Mark Street) or seeing what putting different organic or inorganic materials on film and then hanging it out in the yard accomplishes (e.g. Jürgen Reble, *Schmelzdahin*; Steven Woloshen) or plunging it into the sea (e.g. David Gatten). A few years ago a student at my school buried developed film in dog feces for most of a semester to see if that would cause an interesting pattern of destruction! These filmmakers were all inspired by what happens to film *naturally* if left in less than ideal conditions. To be more specific, they are interested in the ways in which the image *breaks down* as it is distressed and/or decayed. One filmmaker, Bill Morrison, made an entire film, *Decasia* (2002), out of films from the early part of the 20th century that had been made with silver nitrate (instead of the more stable silver halide) as the light-reactive particles in the emulsion. The films were very fragile and flaking off, and Morrison celebrated this as a beautiful aspect of their image.

So what is it that impacts the emulsion? Mold can grow on the surface of film. Some molds eat away at the gelatin in which the silver is suspended, erasing and altering the image while leaving their own biological footprint. You know how mold looks on cheese or on a wall? Well it also looks that way on film and it can be a whole variety of beautiful colors. Chemicals in the soil or air can also eat away at the surface of the film and sun can bleach its surface. Canadian filmmaker Steven Woloshen has devised all kinds of ways to accelerate and/or augment these processes. He advises mixing yeast and sugar, and applying it to color film and then putting the film in a trash bag outside. The sugar activates the yeast and makes it work at eating away at the emulsion (see Woloshen 2009). In the summer of 2012 I put a roll of Regular-8 home movies that I had purchased at a tag sale into this yeast/sugar mix. Here are some stills of the results. Clips of the footage can be seen on the website.

For his film *Oona's Veil* (2000) Brian Frye took a screen-test of the then soon to be wife of Charlie Chaplin, Oona O'Neill, and rephotographed it at an altered speed with lap dissolves. Not happy with the result he made a duplicate of the negative and distressed it with chemicals before burying it in the industrially damaged soil of Flatbush, New York, and then leaving it to air on his fire escape in Long Island City (Queens). After some time in the elements he brought it in, spliced it together and had a print struck with a new soundtrack (a 78 played at 33 r.p.m. so significantly slowed). Because all these mutations were conducted on a black and white negative and then printed onto reversal the positive image (what you see when the film is projected) has significant dark areas where the emulsion was eaten away. What follows is a description of the film by Frye and some images from the film.

FIGURE 1.20
Found Regular-8 home movies, distressed with yeast.

From Brian via email, about *Oona's Veil:*

WHISPERING HOPE, OR GRACE AND HOW TO GET IT

> *As I now beheld the robe, it seemed to me suddenly to become a mirror-image of myself: myself entire I saw in it, and it entire I saw in myself, that we were two in seperateness, and yet one again in the sameness of our forms. . . .*
>
> **The Hymn of the Pearl**

I know of only one film-record of Oona Chaplin (née O'Neill), this screen-test made for a film in which she was cast and never appeared, having met and married Charlie Chaplin before shooting commenced. Hers was quite possibly the briefest ever film career, but brevity is no obstacle to greatness. Some say that Chaplin himself directed her screentest; history says otherwise. To hell with history.

I re-photographed the original screentest, doing 20 frame (I think) lap dissolves from one to the next. The idea was lifted wholesale from David Rimmer, though I've never seen the film(s?) in which he did it. I was interested in the brief transition from still to motion in Chris Marker's *La Jetée*, and wanted to extend it somehow. Anyway, I didn't like the result, as the image shifted a lot. So I made a duplicate negative and did damage to it, to obscure the hiccups. It was exposed to chemicals, buried, and left on the fire escape for a year. What was left over I untangled, spliced together into something approaching a continuous strip of film, and had printed. The result became the master positive. The sound consists of a 78 of "Whispering Hope", played at 33 r.p.m.

The process of destruction through nature takes time. The filmmakers mentioned above left their film to the elements for weeks, months, sometimes years. This requires three things: that you be patient enough to wait, have something you're willing to destroy in this way, and that you have a place you'll be where you can leave your film undisturbed for the time it takes. Because this is all pretty self-explanatory, I won't write a list of what you will need, but I will recommend one thing: that you check up on your film periodically so that you can get a sense of the progress it is making. When you like what you see wash it (gently with water) and then let it dry. The emulsion may be very fragile at this point so I would not get really aggressive with the cleaning. Once it is dry transfer it or print it right away because the film will continue to decay, albeit at a slower rate.

If you are so inspired, you can do a little "tie-dying" with your film before you expose it to nature. This entails using paper clips at intervals (the more the better), clipping several rings of film together. The rings will create areas that are less easily penetrated by the decay and even stripes where the emulsion is

FIGURE 1.21
A scan from Brian Frye's film *Oona's Veil* (2000) showing the effects of being buried in the ground and left out in the elements. Because the film that was exposed this way was black and white negative, the black areas on the positive print are where the emulsion was removed on the negative. This film is also available to view on the website.

FIGURE 1.22
A scan from *Oona's Veil* (2000).

undisturbed. Film that is tightly wound will protect itself where it touches and the decay will begin at the edges and work its way in. Film that is loose and contacted by the elements on all sides will decay more quickly.

TONERS, RETICULATION AND OTHER CHEMICAL EXPERIMENTS

For those of you familiar with still photochemistry and/or the history of cinema, the idea of toning a print or film with chemicals is not a new idea. Unless you have experimented with this process yourself, you probably aren't exactly aware of how it works. Film and paper toners come in ready-made amounts or can be made from scratch with photo chemicals. Basic toners come in reds, blues, yellow/golden, purples, greens and sepia tones. Toners are best used on high-contrast black and white images. Toners replace the metallic silver with either a dye or another metallic compound. In some cases toner actually increases the stability of the image. In others (such as when the toner replaces the silver with a dye) it decreases the stability of an image. Toners can be used one after the other to achieve a third, different effect. Any toner that is on the market that can be used on transparencies can be used on motion picture film.

There is also a toning process called silver plating in which the silver halides are turned to metallic silver. While this image would simply be rendered as a dense image area if projected, if optically printed with a soft front lighting, you would be able to see a very beautiful silvery image. The toner for this process is called halo-chrome and requires that you submerge the black and white film image in an ammonia solution until it is "bleached" and then apply the toner. If your film was fixed with a hardening fixer it is imperative that you use fixer remover before you apply the ammonia. When the toner is applied you will watch as your image re-emerges as a silver image. You can stop the process whenever you have achieved the desired effect.

In addition to chemical toners the crafty film artist can use natural means to tint or dye film. In an early film of mine *Story of Sarah* (1993) I used beets and cabbage to dye the film. I did so on the premise that whatever could dye fabric should be able to, in sufficient solution, dye film. Other people have tried coffee, tea, mushrooms and other natural dyes. In order for these to work the film must be exposed to them for a much longer period than chemical dyes and the vegetable staining will fade rather rapidly so it is essential to transfer or optically print the film within a few weeks, even days, after it has been dyed. See Chapter 7 for more on natural film dyeing.

FIGURE 1.23
A color workprint that was spooled tightly and buried in the "hot corner" of a manure pile for one month. Clips available on the website.

FIGURE 1.24
Film still from *Story of Sarah* (1993). Courtesy of the filmmaker.

Dye/resist/tone

- Toners. There are a whole host of toners available ready-made or in kits, and you can also construct your own from scratch by using the recipes below. However, buying raw chemicals and mixing things yourself can in the end be more costly if you're only toning once or twice so I recommend you start with a kit and move on from there.
- A place to work with a sink, running water and ventilation. A film lab is nice but, if you don't have one, a slop sink in a basement or your bath tub is good (as long as you clean it out really well afterward). I DO NOT recommend working in the kitchen unless you really, really clean up afterward.
- Buckets or trays to tone the film in and rinse it afterward.
- A place to hang up the film to dry.

Reticulation refers to the emulsion cracking and flaking off. While this can be achieved to a certain degree with the sodium carbonate process and some of the natural processes described above, it can also be achieved with chemical intervention. One filmmaker recommends dipping your film in sulfuric acid (a common chemical in the bleach for black and white reversal processes and

very hazardous) and then washing the film with water. Others recommend dunking the film in boiling water and then in an ice bath. In one case it is recommended that you make a heated mixture of potassium permanganate (outside, because the fumes are dangerous) and dip your film in that, then in ice water. Film manufacturers have worked hard to make their film more hardy and less sensitive to sudden shifts in temperature and so reticulation through hot and cold manipulation of the film has become even more difficult (but not impossible) to achieve. One way to experiment with reticulation is to do it as a part of the developing process, using an extremely hot developer (over 120°F) and then subjecting the film to an ice bath wash. Obviously, it is advisable to experiment with developing times (see Chapters 5 and 6 for more information) because heating developer above the recommended temperature decreases developing time.

FILM-DESTROY—CONCLUSION

Throughout this chapter I have listed a variety of destructive techniques for the treatment of film. Obviously there is something very creative and inspiring in this destruction. From the very earliest days of cinema artists such as Man Ray began scratching on film. Film in a sense can be seen as a sculptural medium, with the surface of the emulsion having a thickness that can be manipulated. When light is shone through this surface it reveals the three-dimensional carvings in a two-dimensional plane of light. Throughout this book and in particular when I talk about expanded cinema and performance in Chapter 12 I will argue that film is, among other things, a sculptural medium that you physically carve and manipulate but that also creates physical three-dimensional manifestations in light projections.

This chapter will conclude with the work of film artist Steve Cossman who made the film *TUSSLEMUSCLE* discussed earlier in this chapter. I met Steve at the 2010 Ann Arbor Film Festival, where I saw his work for the first time. In the six degrees of separation world that is the avant-garde film community, Steve was a high school friend of a recent Emerson alum, Sean Hanley. Sean had a film at that year's festival too and reconnected with Steve over their shared love of filmmaking. Later they would work together exhibiting films and teaching classes under the moniker Mono No Aware. Described by Steve as "an annually occurring exhibition of expanded cinema performances that takes place in Brooklyn, New York each November" (Ann Arbor) Cossman began it in 2007, with Hanley and others joining later. Steve describes Mono No Aware as both a haven for like-minded individuals, a place to preserve and practice (and remember) the rituals of hand-made cinema and a platform for building the careers of himself and other participants. Like microcinemas and artist-run labs throughout the world, these small groups of artists getting together are the future of experimental cinema.

BIOGRAPHY OF STEVE COSSMAN

Steve Cossman (b. 1987) is founder and director of Mono No Aware, a non-profit cinema arts organization whose annual event exhibits the work of contemporary artists who incorporate live film projections and altered light as part of a performance, sculpture or installation. In 2010 he established a series of analog filmmaking workshops for the organization and developed an in-person screening series entitled Connectivity Through Cinema. Steve's first major work on film, *TUSSLEMUSCLE* (2007–2009), has screened at many institutions internationally. In 2013, he completed residencies at MoMA PS1 and the Liaison of Independent Filmmakers of Toronto. He has been a visiting artist at Yale, Dartmouth, the New York Academy of Art, SAIC, and the University of Pennsylvania. Steve's most recent work on film, *WHITE CABBAGE* (2011–2014), a collaboration with Jahiliyya Fields of LIES, had its US premiere at Anthology Film Archives. He currently lives and works in Brooklyn as a director, curator, visual artist and member of the collective DecayNY, creating time-based works on film, video and paper. See www.stevecossman.com and www.mononoaware film.com.

INTERVIEW WITH STEVE COSSMAN BY STEVE COSSMAN

In the original email I sent out asking basic questions, I stated the following: "if you have better questions you would like to be asked, by all means ask yourself them (as me) and then answer them. You know your work/process/history so much better than I. You are the expert on your work!" and he took me at my word. So what follows is an interview with Steve Cossman by Steve Cossman. Thanks Steve!

How would you describe your own media practice?

My media practice is an extension of my work as an activist. My time-based work is created in observation of changes in our relation to environments both natural and man-made. I'm also interested the idea of the eternal, of memory, of how things are forgotten or commemorated, different forms of communication, concepts of time, experience, and the forces that shape and define these themes. Animation plays an integral role in my work, as it's a way for me to take the fragments of a sequence and assemble them in such a way that the viewer can reconsider established perceptions associated with object, experience or surroundings. Materials for these works have been sourced from refuse, and repurposed, so that familiar imagery is re-contextualized to create new forms and new languages. In the ritual of restoration my process is methodical, requiring an ascetic dedication and often leaving visible evidence of the human handcraft.

You mention that your art practice came out of your work as an activist. Could you be more specific? What kind of activism?

Over the years I have been involved with a number of peaceful, primarily non-violent, efforts for positive change. At an early age I adopted a vegan diet, associated myself with the straight-edge movement, attended ALF/ELF meetings and was an active member of the student body, holding office all four years of high school. After school, I worked for a CSA farm that provided vegetables to an inner-city area that was without access to fresh produce. Earning little as a farm-hand, I would supplement my income by designing and silk-screening shirts for punk bands and non-profit organizations. While printing I chose to purchase union-made in the United States T-shirts from a small family-owned business in eastern Pennsylvania and even found a US-grown soybean-based screen-reclaiming solution with a neutral pH.

As a young adult I continue to associate myself with various conscious communities and make personal choices that demonstrate my social/political values. Most recently I have taken a strong stance against the unsafe working conditions of the garment industry through consumer activism. I have not purchased manufactured clothing since the factory fire that killed over 100 people outside of Dhaka, Bangladesh, in 2012. I now sew all my own clothing from discarded reams of fabric, remnants and fair-trade organic cottons.

Whenever possible I try to use materials/methods that convey the concept effectively and align with my ideologies. Making the decision to use film rather than DV and to create a camera-less animation for certain works can also be considered a form of consumer activism. Boycotting the use of digital cameras is a choice not to support planned obsolescence or contribute to the waste that it generates. In the case of my films *TUSSLEMUSCLE* and *WHITE CABBAGE*, these films were assembled rhythmically to invoke a heightened sense of anxiety brought on by looming eco-disaster. Mining for single 16mm cells from discarded toy viewers as a source material—in a similar fashion to how we mine the landfills for precious metals—was a way for me to speak to the desperation of our efforts to preserve the current ecological state while also acknowledging the economics of the changing/dying film industry.

Is there a relation between your work, both labors and artifacts, and the notion of community?

Creating the context and shaping the platform for the work are important elements in the overall experience. If the purpose of the work is to communicate an idea or to pose a question to the viewer, then connecting with the audience is critical. This desire to connect is what initially led me to establish the non-profit cinema-arts organization Mono No Aware in 2007.

You mention the idea of community being important to you and the founding of Mono No Aware as a move towards developing a community for yourself/your work locally. How does this group help you interact with other experimental/art groups as well as the larger experimental film/art world?

Mono No Aware allows me the opportunity to engage with the art world, the film industry and the experimental film communities through each facet of the

organization: providing a platform for moving-image art forms at the annual exhibition of expanded cinema, engaging with artists in person at the Connectivity Through Cinema screening series, maintaining an equipment rentals program for local artists, and sharing knowledge with participants of our various workshops and educational initiatives. The moving image has been, and continues to be, such an influential part of global culture—Mono No Aware's interest concerning cinema is rooted in its histories, its practices, its technologies and its possibilities. Our community is a community broadly appreciative of the cinematic art form and its variants spanning generations. It is my hope that Mono No Aware will continue to constitute a haven and a resource for the exploration and preservation of the cinematic arts for years to come.

What inspires you?

The potential of things, specifically human potential, and positive energy.

Would you position your film/media work within a particular genre? As traversing genres? On the margins?

I would say that my moving-image work is perceived as experimental, sometimes blurring traditional and contemporary practices. I employ media technologies as a tool to further the potential of the materials. In my series *Forever Friends*, I photograph friends with whom I share a positive experience or memory. I trace their image repeatedly onto paper and systematically hand-paint forty portraits. Each paper portrait is scanned and saved as a large-format image. All the images are placed onto the timeline, repeated and exported as a moving-image file. The paintings then can be played on screen, referencing internet presence, and loop indefinitely, creating an illusion of perpetuity. Held in a video container, the works are often described as videos, but to me these are achieved with the use of more paint than video material. Rather than staring at a painted image, the viewer exists in time with the painting.

Are the distinctions pertaining to analog vs digital, or cinema vs video, or current vs "dead" tech, relevant to your interests and practices?

Only in relation to the viewer experience, with specific regard to conveying/articulating the idea behind the work accurately.

Can you talk a bit about the economics of your art practice and community building? When your average person thinks of motion pictures they think of a big industry. What relationship does your practice have to that, if any? Is it oppositional, confrontational or ambivalent?

As humans, we are all subject to the same constraints of time and space.

As a member of society, I create work as I have the time and means with which to do so, using the tools and materials accessible to me. Although I operate outside of what most would call the "film industry" and make work that does not fall into a category that the average person would classify as a "movie", it

is not a choice made in opposition to big-budget feature films. The approach and intention are so different that the parallels are few or far between.

Community building is optimal when there is openness and inclusion. I've fought for years to maintain a strong sense of accessibility in our public programming. Through generous supporter donations and the efforts of our volunteer staff, the organization has been able to minimize workshop enrollment fees and make many of the screenings inexpensive or in some cases free to attend. Participants span a wide range of economic classes, belief systems, age groups and backgrounds. That diversity of ideas gives strength to the group and allows for a rich cultural experience. Within my own practice, inclusion comes in the form of universally recognizable imagery, common materials and contexts.

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CHAPTER 2

Film-create

Whether you start with found footage, black leader or clear there is a corollary process to the film-destroy and that is creation on the very surface of the celluloid often without use of a film camera as a generative device. There are those who start with an entirely blank canvas of clear film and draw or paint directly on the surface. Sometimes the artist will also use lab processes and/or printing to produce mattes or rephotograph series of images. Sometimes the artist relies entirely on his or her handicraft and makes an entire film through the careful, frame-by-frame rendering of an image. Whereas the last chapter was mostly about taking away, this chapter is about adding. It is about making something completely new that usually has little or no camera involved but nevertheless is still cinema. Film doesn't require a camera to be a movie.

In fact, before movies, there were painted magic lantern slides, kinetoscopes and other optical toys. Animation precedes photography in the history of cinema. Photography and realism became dominant because that was the spectacle that the public most desired. But before realism there was fantasy and it is from this fantasy, this abstraction, that direct animation or the application of paint, pens and a host of other devices to the surface of film, is drawn. Both subtractive (destroy) and additive techniques (create) are all considered direct animation because they occur at the surface of the celluloid, so to a certain degree my separating them into two chapters is a bit arbitrary. But as a teacher I have found that beginning with found "realist" footage and slowly abstracting it and taking away from it prepares my students best for working with the blank canvas.

To begin we will talk about painting. An additive technique usually at its most abstract in cinema because the frames, particularly of 16mm but also of 35mm, are so small. There are 24 frames in a second of sound cinema (25FPS outside the United States) and 1440 frames in a minute. Even if you draw a frame every minute it would take you twenty-four hours of uninterrupted labor to finish the same length that it takes a single minute to film on a motion picture camera. So, animators in general and direct animators in particular have to be patient and very, very persistent.

PAINTING

One of the most beautiful hand-painted films of all time is Harry Smith's *Interwoven No.3* (1947–1950). It was originally painted on 35mm clear leader using a variety of taped lines, cubes and dots, applied one can only guess with tooth picks, to act as resist, which were then painstakingly removed and reapplied in a different pattern for another coating of paint. The entire 3½ minute film was made to synchronize with the song "Guarachi Guaro" by Dizzy Gillespie. In order to do this Smith notated the song, beat by beat, analyzing how it progressed second by second. This allowed him to create images that would move in sequence with the song. The images in *Interwoven No.3* are very bright and have a texture to them that indicates they were probably make with a variety of inks with various consistencies. There are no wiggly lines in the film, no hand drawing or scratching and no blank spaces, no white. All of the paint was applied by hand over patterns of resist, which were then removed and new ones laid down so that in some areas colors would blend and in others the first color would be protected. This technique is an application of strategies used in batiking fabrics and paper, something Smith, with his interest in non-Western culture and art, was no doubt familiar with and influenced by.

The original film was produced on 35mm and at times, it is rumored, was up to a half an hour in length! It is no wonder that Smith was working on it for almost ten years. The film was finished by being optically printed onto 16mm, the preferred distribution format for short films. This film was included in a collection of shorts on the compilation *Avant Garde IV* put out by the National Film Archives. The transfer on this DVD is very good and it is worth watching it in frame advance to see how the frames change one to the next throughout the film. Smith would make a variety of animation and live action films throughout his life, although *Interwoven No.3* is singular in his *oeuvre* for its technique. He would also collect Ukrainian Easter eggs, witch's cradles (a string game) and recordings of spoken word and folk music, the latter becoming the *Folkways Compilation* put out by the Smithsonian Museum.

Other filmmakers of the 1940s and 1950s who worked directly on the film surface were Len Lye and Norman McLaren. Although they knew each other during their formative years working in London with John Grierson and others at the Postal Film Unit, their style was very different. New Zealand-born artist Len Lye tended toward working with a variety of materials on the surface of the film, stamping, typing, painting and then using lab-based printing processes to layer and augment his direct animation. He was inspired by the body art of the Maori when he made work such as *Trade Tattoo* (1937), ostensibly an advertisement for the British postal service to run between features in movie houses of the 1940s.

Norman McLaren tried just about everything you could try working with celluloid including live action, stop motion animation, optical printing and direct animation of all kinds. He understood the capabilities of the film laboratory and, after relocating to Canada, had the generosity of the Canadian

Film Board and their state-sponsored lab to help support his ideas. His drawn-on film animation tends to be with brush or pen and is usually abstract, although he can tend toward symbolic or biomorphic images as well, such as hearts and notes in *Begone Dull Care* (1949) or the representation of birds in *Blinkity Blank* (1955). In his seminal treatise *Pen Point Percussion* (1951) he explains how he makes hand-drawn animation *and* soundtracks. The film begins in live action as McLaren shows how to make these soundtracks and images by hand. The end of the film is the thing he has made.

In most 16mm and 35mm film the sound is created optically. Here's how it works. A soundtrack is created by whatever method the filmmaker chooses and is mixed and synced to the image. Once the sound is complete it is sent to the lab and they make an *optical track*, a visual representation of that audio signal that runs down the side of the film and can be read by an optical head in a projector. Light shines through the track and the pattern (shadow) that the track creates on the optical head is transferred back into an electrical signal, which whizzes down the cable and into the speaker system, where the speaker turns it back into sound waves so our ears can hear it.

McLaren understood this and had studied the patterns of sound waves. He knew that fat brush strokes sounded like a tuba and short, thin lines sounded like a high-pitched beep. He knew that the more lines you put closer together the faster the beeps would sound. Experimenting with making sound visually, he created whole short films with drawn soundtracks that synchronized with hand-drawn images. McLaren, like Lye, made excellent use of the film labs by having lab technicians turn his black and white images into positive and negative mattes, and then print them in color. Much of McLaren's direct animation involved significant lab processes. Nevertheless his direct animation was distributed widely in the United States and Great Britain, and many a filmmaker counted him as both an inspiration and mentor.

Several artists were mentioned in Chapter 1 who can also be discussed in terms of their work painting on celluloid. The seminal American experimental filmmaker Stan Brakhage is a less institutionally sanctioned version of Norman McLaren in that, although he was and continues to be thought of as one of the most influential US experimental filmmakers, he was not broadly recognized by either governmental or art world institutions. In general, in the United States, experimental cinema has not been incorporated into the art world or supported by national funding for the arts at the same level as other performative or plastic arts, or at the same level as experimental film in Canada or Europe. So Brakhage can be accurately described as the emperor of a world that very few of his fellow Americans knew or cared about.

Throughout his intensely productive career he produced over 300 films ranging in style from live action to direct animation with moth wings and other garden detritus to hand-painted films. His work was almost always very abstract and the number of his films with sound can be counted on a single hand. Unlike McLaren, who mostly worked in 35mm or 16mm, Brakhage celebrated the

small gauge of Regular-8mm and privileged the hand and eye of the filmmaker in all stages of film production including post-processes such as developing and negative cutting. He is the grand-daddy of hand-made filmmaking in the United States. His early "textbook" of filmmaking, *A Moving Picture Giving and Taking Book* (1971), is more of an ideological treatise than a how-to guide, although there is plenty of instruction in there as well. The most important maxim is to forget what you think you know about film and start as though you have just encountered it. Brakhage explains it as its very material self, what it is physically and asks you to build your experience of it from there, from the very materiality of the object.

Brakhage began hand-painting films in the 1980s. Most of this work was done on clear 16mm leader. In most of these films there is a dense blackness out of which beautiful bursts of color emerge. As much as Harry Smith's *Interwoven No.3* looks like moving color field paintings, Brakhage's hand-painted films are like moving abstract expressionist work. Like Jackson Pollock he gives them names to inspire a sense of their monumental intention or epic lineage, with titles like *Glaze of Cathexis* (1990) and *Panels for the Walls of Heaven* (2002). Brakhage taught film as art at the University of Colorado, Boulder, for over thirty years. He was one of the first faculty in the film program at the Art Institute of Chicago. More than any other filmmaker in the 20th century he was responsible for promoting experimental cinema as an important modern art form. He also was a great friend, mentor and inspiration to many filmmakers.

Jennifer Reeves is a contemporary film artist who credits Brakhage directly as her inspiration to paint on film in her works *The Girl's Nervy* (1995) and *Fear of Blushing* (2001). These films are painted over live action but for the most part the images behind the painting are like distant shadows, only sometimes poking through with a symbolic significance. What these films feature in terms of technique is gorgeous reticulation (cracking) of the inks used and very deep and rich colors. Reeves always optically prints her own works so she can also compose the work by altering the speed in the printing, emphasizing parts of the image that she especially likes. (For more on optical printing read Chapter 3.)

So I hope I've convinced you of how gorgeous hand-painted film is. Now let's take some time to talk about techniques and tools. Because there is a very large variety of options available and filmmakers frequently combine painting with other direct animation techniques, I will break this section up as follows: setting up, inks/paints/dyes, resists (things that stop or change the application process) and application tools/techniques.

Workspace, supplies and specifications

GAUGE

Film comes in various gauges but the bigger the canvas, the easier it is to work with. Thus 35mm is significantly easier to work with than 16mm, but you can

still find 16mm slot-load projectors (the easiest ones to load and absolutely necessary for loop work) relatively cheaply. If you want to be able to look at your work projected as you proceed, 16mm is the way to go. If you want a bigger canvas and can wait and pay to transfer it or print it then 35mm may be the way to go. There are 35mm film viewers out there but they are large and heavy, and probably not what you want to invest in right off the bat. You can also scan short lengths of 35mm on a flatbed scanner and then composite them digitally. With every gauge there are drawbacks and advantages to consider in terms of your tools, workspace and processes.

SPEED

Sound speed film runs at 24 frames per second (25FPS in Europe). A second of 16mm is a little over 7″ of film (24 frames). Six feet of 16mm is 10 seconds projected and 240 frames. One second of 35mm is also 24 frames. There are 16 frames of 35mm per foot so a second of 35mm is one and a half feet. Silent speed is 18FPS but very few venues have projectors that run at silent speed. A foot of Super-8mm film is 72 frames or three seconds at sound speed and 4 seconds at silent speed. It is useful to remember these relationships as you work so that you can imagine timing on the screen as you work by hand.

EMULSION/FRAME ORIENTATION

You want to paint/ink on the emulsion side of the film and you want to remember the film orientation so you achieve the frame orientation (left/right, up/down) that you intend. This is easy if you are working on found footage where you can see which way is up, but what of film that is more abstract or if you are working on clear leader? If you have single-sprocketed film (film with sprockets on one side) the sprockets go on the left. You work from the top of the film down and left to right. Super-8mm is the same way. If you are working on 35mm (which always has sprocket holes on both sides) or 16mm with sprocket holes on both sides, first determine which is the emulsion side (the base is shinier and, if put between your lips, does not stick) and then work on that side following the rules above (from top to bottom and left to right). You can also work directly on color negative film that was unexposed (or barely exposed) and then developed. This film has an orange mask to it that when printed will be filtered out. All the colors you apply will be rendered as their opposites. In this case it is imperative that you use inks that really bond to the emulsion. In addition, unless you have the lab strike a "dupe neg" (duplicate negative) you will be printing off of your original hand-drawn animation every time you make a print. Still, doing this is really out there on the experimental edge.

WORKSPACE/TOOLS

Have a dedicated work area that no one will mess with. It is ideal if you have a light box or table. As noted in Chapter 1 these are possible to purchase

relatively inexpensively or you can build your own to suit your finances and living space. There are a number of DIY instructions on building a light table online for all kinds of purposes. A sync block is also useful but not necessary. If you don't have one it is a great idea to put down a strip of tape on the edge of your workspace facing you that has frames marked on it for the gauge you are working with, in whatever way is most useful to you, either time or length intervals. If time is your thing, mark off 24 or 48 frames, with markers every 6, 12 and 24 frames to indicate a quarter, a half and a full second of projected image. Steenbecks (flatbed film editors) usually have this kind of measuring strip at the very front edge of the machine. Whichever works for you, just put a piece of paper tape or masking tape down and, using a piece of film, mark it up.

Inks/paints/dyes/resists

INKS AND PAINTS

When you go to find your inks and paints you will want to go to a really good art store that sells drafting materials. While you can use a whole variety of inks on your film, only the drafting inks will really bond with the celluloid. India ink is gorgeous, but it flakes off. This is actually really good because you can get the effect of reticulation quite easily, but it also makes your film very fragile and flaky in the projector or optical printer. You can also use food coloring as a dye on film, but the color is not as intense and it fades quickly. A good rule of thumb is to look for ink that can be used on plastic. If it will draw on plastic it will draw on film.

Spray paint can produce amazing effects on film when applied very lightly. Remember, anything that is opaque (you can't see through it) will be rendered as black when projected no matter what color it looks like on the surface. This applies to nail polish as well. Nail polish can be used as a paint on the surface of the film as long as it isn't too gloppy. However, it does tend to flake off after a few projections and most polishes are not translucent.

RESISTS

These are things that will keep ink from the surface as you are working, a way to protect your image. The important thing about resists is that they are easy to remove afterward without damaging your ink job. Nail polish will not work because the acetone required to remove it will remove the ink as well. A good resist is masking tape, which can be cut into a variety of shapes and stickers. It is a good idea to experiment with stickers on film before you commit because you may need to get them wet to remove them and, again, that might ruin your ink job.

While not strictly a resist, Vaseline and vegetable oil can create floaty layers of ink. Put down one ink layer, let it dry, then apply a small amount of oil or

FIGURE 2.1
Pen, ink and paint. Although the paint looks light green, it is somewhat opaque and appears dark green when projected, whereas the pen appears blue and pink.

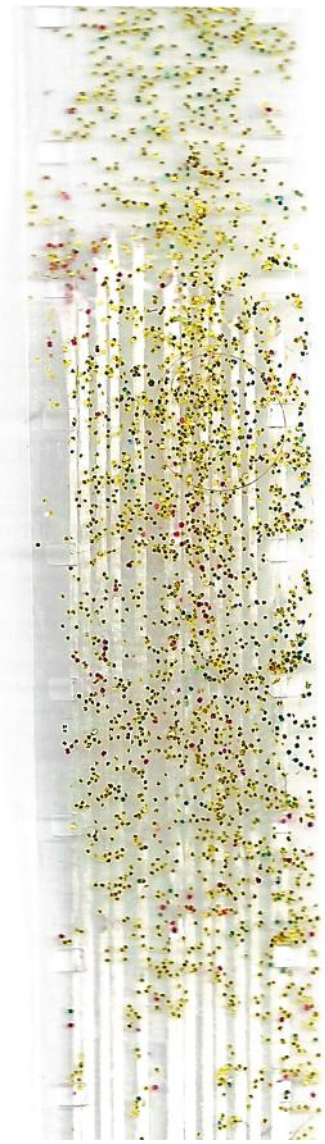

FIGURE 2.2
Glitter nail polish and packing tape. When applying glitter nail polish or glue you will notice that some glitter is metallic/opaque when projected and some is plastic and light will shine through the glitter.

FIGURE 2.3
A combination of yellow semi-opaque paint and with red ink underneath. Layering inks and paints creates a canvas that can be carved back into.

Vaseline and then more ink. The greasiness separates the layers of ink. One caveat: it takes forever for this to dry so using a hairdryer on it is an excellent idea. Even then it has a bit of malleability for quite some time. If it helps there is an analogy here to oil painting. Oils take a long time to dry, but you can work on the layers over time. Latex dries quickly. Using Vaseline and vegetable oil is more like oil painting.

Application tools/techniques

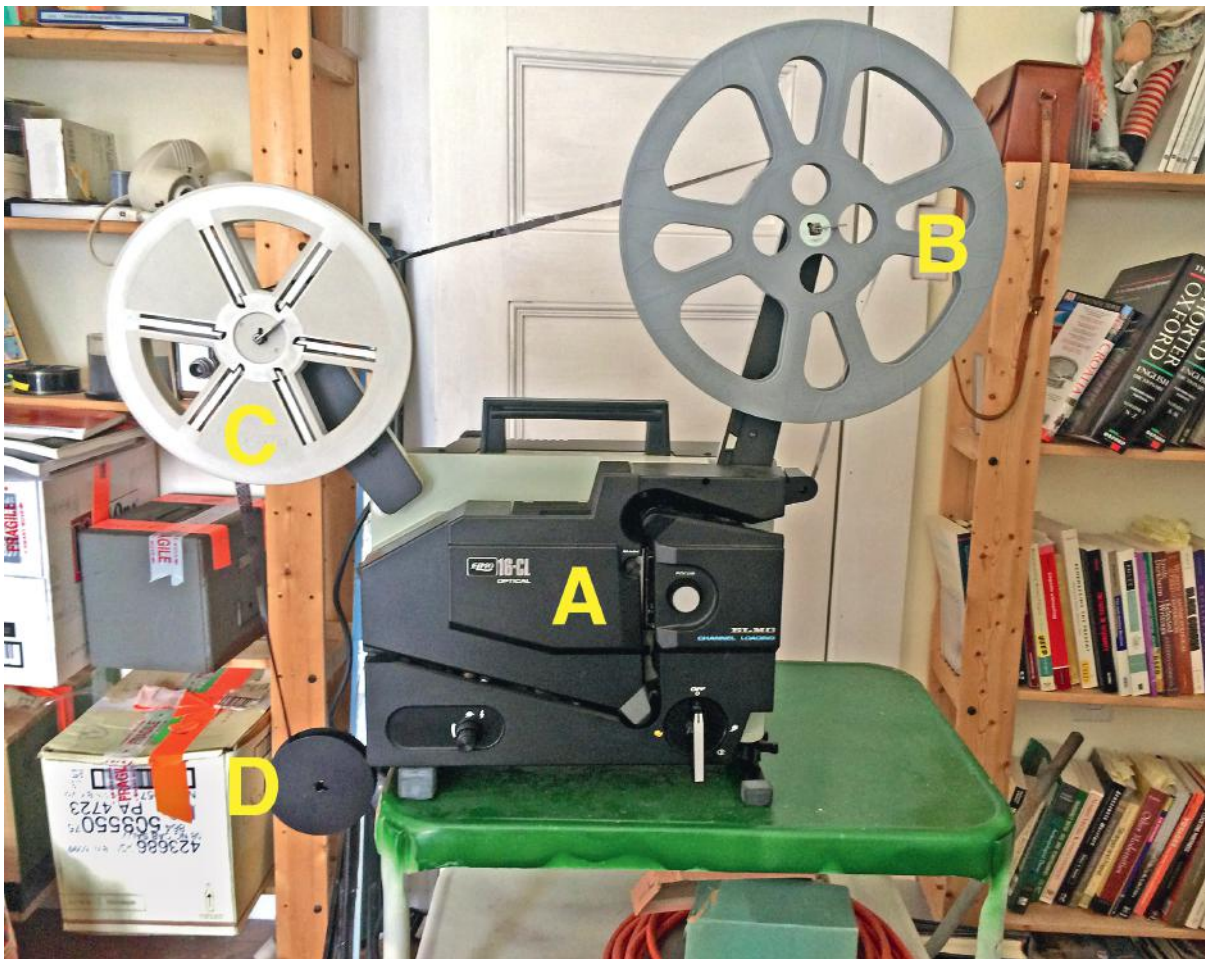

FIGURE 2.4
A slot-loading projector with a film loop. First splice the loop together (A). Then, with the sprockets toward you, slide the film into the gate area first, then through the top part of the loop up toward the feed spindle (B), then through the channel at the bottom toward the take-up spindle (C). Make sure that the film is not twisted and that you can move the film freely through the channel by gently sliding it back and forth. You will likely need to provide a little tension for the loop to run properly through the projector. If so, you can hook the loop over a daylight spool on the front spindle, rear spindle or both (D).

The following tools are useful for getting ink onto your film and manipulating it once it is there:

- Paint brush.
- Eye dropper.
- Sponge.
- Toothbrush.
- Technical pens (these can be quite spendy but will draw really fine lines).
- Wire mesh, cheese cloth, small cheese graters—any of these can be used between the spray paint and the film to produce a pattern on the film. You must let the paint dry before you peel it off for it to work.

CAVEAT! Since working on direct animation takes SO long, when working in 16mm, I recommend you begin by working on 6ft strips (remember that's 10 seconds projected). This is just long enough to run through the projector as a loop so that you can see the fruits of your efforts multiple times in one go! To make a loop, cleanly splice the ends of the film together (make sure not to twist!). Then use a slot-load projector and load your film as you would normally. You may need to hold your film taut at the top so that it doesn't jam up and/or use a daylight spool on one of the spindles so that there is some tension.

DRAWING

In the pages above, I referred to drawing and painting on film to create abstract or geometric images. This section is about *representational drawing* on film. This is the rendering of (usually biomorphic or even realist) images *directly on the teeny, tiny frame*. This takes a lot of time, precision and the eyesight of a diamond cutter, or at least really, really good magnification. As you might guess, there is not a staggering amount of people who draw frame for frame on film, although it is a sizable enough amount given the effort it entails. The first person I would like to mention is someone I can guarantee (unless you are an anthropologist or one of my or his students) you have *never heard of before, ever*. He was a kind of idiot-savant of hand-drawn animation, only he is the total opposite of an idiot. He almost entirely made the whole process up for himself with no prior knowledge of filmmaking.

The man's name is Robert (Bob) Ascher and for most of his life up to the point he became interested in film he had been a leading voice in post-processual archaeology (look it up) and a professor at Cornell University. And yet, for no explicable reason other than the words of Navajo Sam Yazzie and a fatigue with the anthropology of his time, in the early 1980s Bob Ascher decided to start making films about myths. Because he couldn't afford a camera or lens, he decided to draw the myths directly onto film. A friend of his at Cornell Cinema showed him the work of Len Lye and Norman McLaren, and that was all it took. He reached out to McLaren for a little advice, who encouraged him

and gave him a piece of 35mm film with frame lines, and away he went. In the course of a little over ten years he made four beautiful films, all hand-drawn. Because he really didn't understand the back end of film or animation he drew every single frame from the titles to the credits. He did not know that you *could* draw 12 frames a second and then have your film printed 2 frames for every 1 frame (this is called drawing on twos), which would have saved him a significant amount of time and effort. He did not know how or have the resources to have his titles and credits optically done. He would work on a film for a year or two and then send it off to the lab as a single roll for them to optically print onto 16mm color negative and attach a soundtrack he had prepared (see Ramey 2014).

His films are drawn with a very fine technical pen, directly on clear leader. He inks his frames with paint brushes and small sponges. He works with a lamp that has a magnifying glass in it so that he can bend it over the work. In addition to the 35mm frame guide he got from McLaren, he had a friend machine brass pegs into the plexiglass top of his light table so that the film would be held in place as he worked. He would also use graph paper as a means to plot movement across a frame. Although his films were distributed for a time by Cecile Starr (author of *Experimental Animation*), Canyon Cinema Cooperative (an experimental film distribution cooperative out of San Francisco) and Cornell University, he was a virtual unknown in the experimental and art cinema world and his films did not find the kind of institutional rentals that other animators and experimental filmmakers have enjoyed. Despite his lack of high visibility, he is the perfect animator to demonstrate line-drawn direct

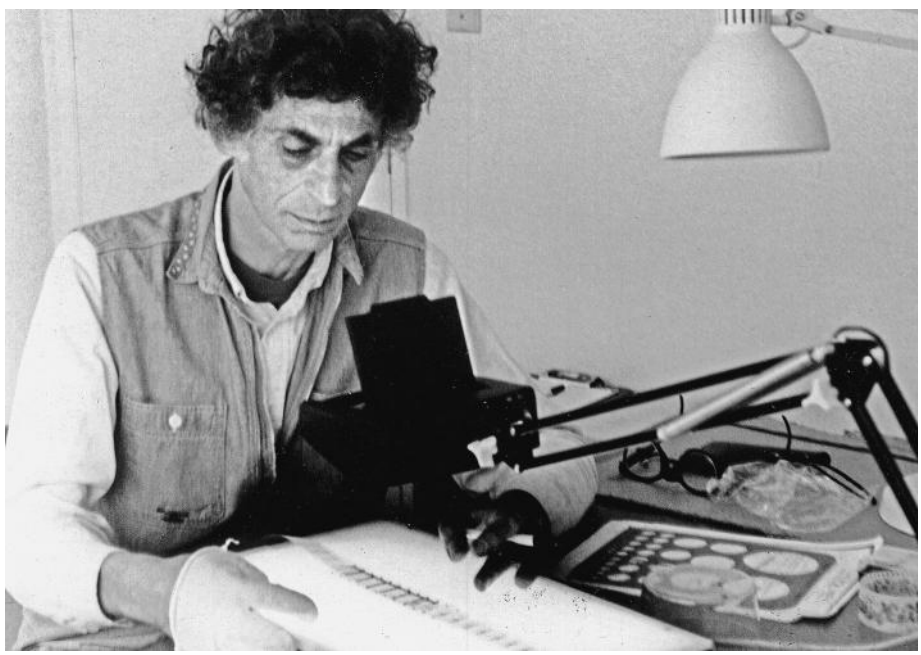

FIGURE 2.5
Bob at work. Photo courtesy of the artist, taken by Marcia Ascher. Notice the lamp with magnifying glass.

FIGURE 2.6
Hand-painted frame from *Bar Yohai.* Courtesy Bob Ascher.

FIGURE 2.7
Hand-painted frame from *Blue.* Courtesy Bob Ascher.

FIGURE 2.8
Hand-painted still from *Golem*. Courtesy Bob Ascher.

animation. After the section on the necessary tools there is a two-page spread exhibiting stills from his work and working environment.

Of course there are other drawn-on film animators than Ascher and many of them use tools besides technical pens. Sharpies, particularly the ultra-fine variety, as well as Staedtler pen sets are great ways to get started with drawn animation too. In my classes I actually begin with a bunch of Sharpies and ink, and then help the more advanced students move on to buying their own technical pens.

Line-drawn direct animation

- Light table or box.
- Way to register film (hold it in place as you work).
- Graph paper or grid drawn on clear leader that you will put underneath your animation.
- A technical pen with an assortment of nibs.
- Drafting ink.
- Paint brushes.
- Small sponges.
- A magnifying glass light, jeweler's glasses or other hand-free magnification device.
- A viewer so that you can see the film in motion as you work.

PROCESS

1. If you are trying to mimic a particular human or animal action, a blink, someone walking across the frame, a yawn, it is best to analyze live action first. How many seconds does it take for the action to happen? What are the movements? How are they broken down into individual still frames? If you can, find video of this online and advance it frame by frame to see the subtle shifts in motion.
2. Then decide if you are going to work on 1s, 2s, 3s or some larger interval. What this means is that, if you are working on 1s, every frame you draw will be shown in the final version just once at 1/24th of a second. If you plan on showing your original, you are obviously working on 1s. If you are going to transfer the original to digital or rephotograph it onto film, you can change the number of times a single frame is seen. Thus if you work on 2s you only need to draw 12 frames for 1 second of motion. Two frames (or 12 frames a second) is about the threshold of human vision to perceive a series of stills as fluid motion. After that (shooting on 3s or 4s) motion is no longer perceived and animation looks choppy. Think anime.
3. Once you have decided what your drawing ratio is, leave several frames at the top of the leader blank so that you have something to grab onto when you move the film around. If you are drawing with inks or pens, you may want to hang up the film to dry fully before you handle it too much. Handling film on which the ink is not set will result in smudgy film.
4. Once you have completed about 6ft of film make a loop and run it through a projector. If you have a flatbed or viewer nearby you can also run it through this to see how your motion works at different speeds.
5. If you've made 6ft, that is 240 frames or 10 seconds of film on 1s, 20 seconds if you plan on reshooting on 2s. Determine how long you want your film to be. That's how many frames you need to draw!

MAKING SOUND

So back to Norman McLaren and his *Pen Point Percussion*. In that film he draws and paints on 35mm clear leader and then sends it off to the lab to have an optical struck from it. What he was essentially making was a negative—dense marks on a clear background—for his optical track, which when printed will become clear marks on a dark background that are legible to an optical head as a soundtrack. Without involving the lab, there are still a couple of ways you can make a soundtrack that you can pop into a projector and hear right away. Remember how we talked about film orientation? When we are working we need emulsion up towards us, the sprocket holes on the left and the soundtrack along the edge on the right. Remember 16mm film sound is 26 frames *ahead* of the picture that will be shown with it. This is because in the projector the optical track reader is 26 frames away from the picture plane. So, if you are drawing a soundtrack to match your pictures it needs to be 26 frames before

its corresponding image. You can either make a soundtrack on clear leader or black. Instructions and information on supplies follow.

If you are drawing a soundtrack onto clear leader I recommend you do it first so that you don't run the risk of ruining your image by putting masking tape over it. If you are scratching your sound into black leader, I recommend you do it after you have already scratched/bleached your image. Also, if you are planning to scratch in a soundtrack onto your black leader and you are bleaching in your image space, be sure to protect the optical area with masking tape while you bleach. Finally, you *can* make a soundtrack on found film that already has a soundtrack on it. You would essentially follow the instructions for working with clear leader and work over the existing soundtrack OR you could bleach your soundtrack area BEFORE you begin working on the found footage and then, when you have completed your work on the image, follow the instructions for working with clear leader below.

One last thing, when drawing a soundtrack, remember the following:

- Volume can be controlled two ways, by the clarity (lack of opacity) of the marks and by the number of them per frame.
- Pitch depends on the number (and thus the width) of individual marks in a single frame of sound. More marks, higher pitch; fewer marks, lower pitch.
- To make continuous sound there should be no break between marks. That doesn't mean blend them all together; it means that in between sounds there should be a thin vertical line.

Supplies if drawing soundtrack on clear leader

- Clear leader either already drawn on or to be drawn on.
- India ink.
- Masking tape.
- Hairdryer (optional but really speeds things up).
- Fine pins and X-Acto blades for scratching sound.

Process for drawing on clear leader

1. With the sprockets on the left tape your film at the top and the bottom of your light table or workspace.
2. Apply a strip of paper tape or masking tape vertically so that only 2mm on the right-hand side of the film is visible.
3. With a brush densely apply black India ink and wait for it to dry completely OR blow it dry. It is not a terrible idea to do a whole 6ft strip (10 seconds) at a time to speed up the process.

4. Once it is dry you can scratch in your track. Remember, fat lines are lower-pitched sounds, whereas skinny lines are higher-pitched sounds. Wider lines are louder, narrower, softer. The closer together the lines, the more frequent they will be.
5. Listen to your new soundtrack on a projector.

Supplies for working with black leader

- Black leader.
- Something to soften the emulsion like Fantastic™ (optional and you will want to cover the image area if you do this).
- Masking tape.
- Fine pins and X-Acto blades for scratching sound.

Process for making a soundtrack on black leader

- With the sprockets on the left tape your film at the top and the bottom of your light table or workspace.
- Apply a strip of paper tape or masking tape vertically so that only 2mm on the right-hand side of the film is visible (optional—this is only necessary if your process in making your soundtrack will disturb your image area).
- Scratch your track. Remember, fat lines are lower-pitched sounds and skinny lines are higher-pitched sounds. Wider lines are louder, narrower, softer. The closer together the lines, the more frequent they will be.
- Listen to your new soundtrack on a projector.

STAMPING

Just like the ink you use to paint with, the ink you use to stamp with must NOT be water based. It must be able to print on plastic. There are so many cool stamps out there, including letter stamp sets, that you can use in addition to your painting and drawing. Look for stamps that are small, like the 16mm frame. This set of individual stamps has been much loved by my students over the years as a quick and easy way to create cool repeating patterns.

Supplies for stamping

- Clear leader.
- Stamp pads of various colors that will adhere to plastic.
- Stamp sets.
- Index cards or paper for blocking.

Process for stamping

1. Put down white paper (there is no need for a light box, because stamps on clear leader are easy to see). If it makes it easier (and it probably does) use a fine-tipped black Sharpie to draw framelines on the paper so that you can align your film before you put it down.
2. Tape down your film at the top and bottom, sprocket holes to the left and emulsion up, so you can work on about 2 seconds (48 frames or 1 ft) at a time.
3. Working from top to bottom, stamp your films. Try to make objects move through the frame. Remember, if you want it to move vertically you will need to put an index card on the frameline so that your stamp doesn't go into the frame above or below.
4. Since you are already there, you can work on your soundtrack simultaneously. Use your index card to protect the frames and experiment by stamping in the optical track area.

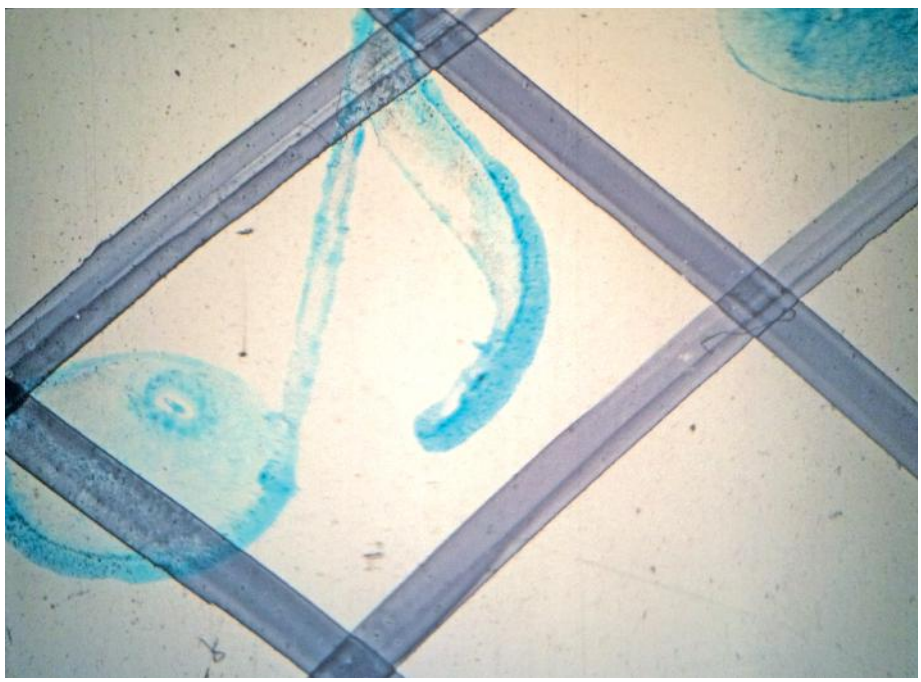

FIGURE 2.9
A film still from a student project called "DADA" that is included on the website. This film features all kinds of direct animation including stamping, drawing, scratching, laser printing, Letraset and stickers.

RUBBINGS

Rubbings are sort of like stamping, only in reverse. There are two ways to do rubbings. You can put black leader or found footage over a hard, bumpy surface (e.g. a large file, wire mesh, the size of a LaCie Quadra drive), emulsion side up, and taking a safety razor blade scrape away the film emulsion. Alternately, you can take sheets of semi-translucent contact paper or paper tape and lay them over a hard, bumpy surface. With an inked rubber roller (like you would apply ink to a woodblock) gently roll over the tape or paper. Then cut the contact paper or tape into strips that are the appropriate width for clear leader. Make sure NOT to cover up the sprocket holes! Although it really helps to have a light box or table around when you do this, it isn't absolutely necessary.

So far as I know Devon Damonte is the guru of this practice and it must be acknowledged that what I know about rubbing has been learned from him through email exchanges and screening his loops. Therefore, the interview featured in this chapter will be with him. There are also some clips of his work on the website. Devon teaches animation at the Evergreen State College (my Alma Mater).

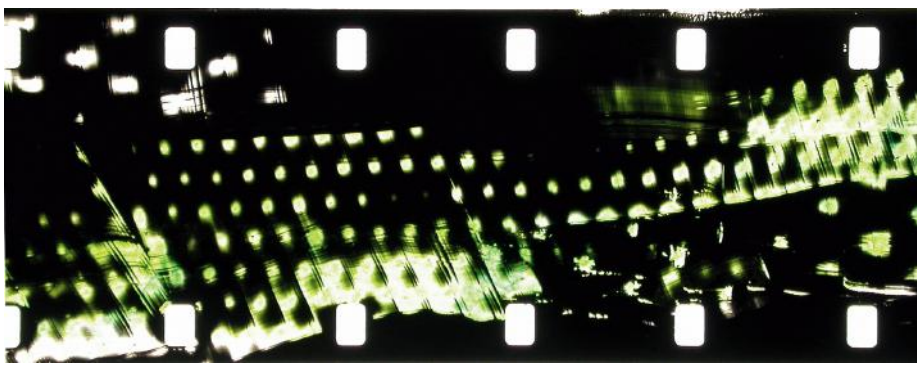

FIGURE 2.10
Rubbing of something bumpy. Black leader over a zester. Courtesy of Devon Damonte.

Supplies for rubbing

- Black leader, found footage or clear leader.
- A razor blade (if working on black leader or found footage).
- A brush (if working on black leader or found footage).
- Ink that will adhere to plastic and a roller (if working on clear leader).
- Translucent contact paper or paper tape (if working on clear leader).
- Scissors or X-Acto blade (if working on clear leader).
- Ruler or straight edge (if working on clear leader).
- Hard, bumpy things.

Process for rubbing

1. Put your black film, found footage or contact paper/translucent tape firmly over the bumpy things with the emulsion or non-sticky side up. This may require taping down.
3. On black leader, firmly and slowly drag the blade over the film. Use a brush or blower to remove the emulsion.
3. Unstick the film and move on to the next bit.
4. On contact paper/translucent tape, ink your roller and roll it over the contact paper/tape, being careful not to get ink all over the thing you are rubbing. If there is any question that you might and you or the owner of the bumpy object cares, use cellophane underneath to protect the object!
5. When you have a whole mess of contact paper/tape with images on it, carefully cut it into strips the width of the 16mm film frame. Remember, sprocket holes go on the left! If you tape over the sprocket holes use your X-Acto to cut them free without damaging them.
6. Tape the ends together to form a loop and project!

LETRASET/PAPER TRANSFER/PLASTIC BAGS

Much like rubbing this process is all about transferring images from one place onto your film. There are three processes that I will describe in this section and all of them are fairly easy to master.

Letraset is a product that was designed for illustrators to use *before* computers. It has evolved into a beloved tool for many comix (comics) artists and others. Letraset is available in sheets of various typefaces and in various sizes, and in shading and style sheets. Some sheets come in a variety of colors, but remember anything you can't see through will be rendered black in projection. They are manufactured on clear plastic sheeting and it is very easy to place them over your frames and rub the letters and textures on. When projected, Letraset looks amazing. Letraset is available at art supply stores and online.

Supplies

- Letraset (remember the size of the 16mm frame and pick something small).
- Something dull but small tipped to rub onto your film. Really dull pencils work well as do wooden cuticle pushers.
- A work area either covered with white paper or a light box to work on.
- Index cards.
- Clear leader or found footage you would like to apply Letraset to.

Process

1. If you are working with clear leader, it would help for you to work on white paper or next to a piece of tape, or over a transparency with framelines drawn in, so you know where the edge of your frames are.
2. It is not a terrible idea to take an index card and cut out a rectangle the size of a 16mm film frame. As you work you can move the frame along.
3. Work right to left and top to bottom so that your film is oriented correctly.
4. After you've made 6ft, make loop and project!

TRANSFERS FROM PLASTIC BAGS

This technique I learned directly from San Franciscan experimental filmmaker Thad Povey by watching his film at the Ann Arbor Film Festival in the late 1990s. In order to make this technique work you need to find plastic bags that have a colorful design painted on them. These are the only kinds of sacks that will work. Bags that do not have their designs painted on them often look shiny. If you look closely at the bags you will be able to see texture in the painted area.

Supplies

- Clear leader or found footage.
- Painted plastic bags.
- An iron.
- Something to iron on (a big piece of wood works or newspaper over a table).
- Newsprint or butcher paper to place between the plastic bag and the iron when ironing.

The process

1. Turn on iron to nearly its hottest—this is tricky so you will want to pay attention while you are doing it. Too hot and the plastic melts. Too cool and the transfer doesn't work.
2. Cover your work surface with a few thicknesses of newspaper if the surface needs to be protected.
3. Put down butcher or newsprint paper.
4. Lay down your film, sprocket holes to the left, emulsion up.
5. Lay your plastic bags over the film, painted surface down. If you are trying to line up the plastic you can cut it into strips and tape it down with masking tape.
6. Lay a piece of newsprint or butcher paper on top of your film/plastic sandwich.

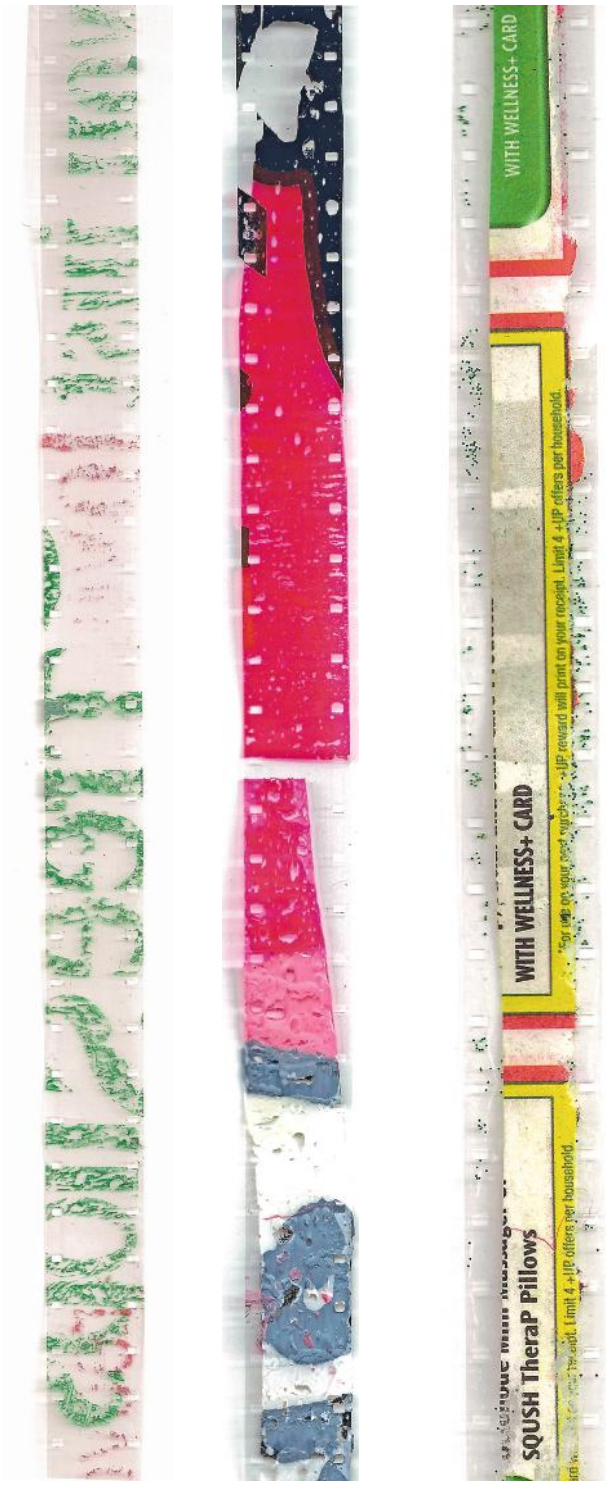

FIGURE 2.11
(*Left*) Using an iron, paint from plastic bags has been ironed onto clear leader. The transfer was from a bag with lettering and for the most part only the paint was transferred.

FIGURE 2.12
(*Middle*) Large blocks of color transferred from a bag.

FIGURE 2.13
(*Right*) A strip of plastic back that is semi-opaque that has been cut to size and then ironed onto a strip of 16mm film.

7. Press the plastic onto the film, checking to see if the paint transferred but avoiding melting the whole mess entirely.
8. Repeat until you have done the length that you want.
9. Make a loop and project!

STICKERS/TAPE/CONTACT PAPER

Stickers and tape are perhaps the easiest thing to apply to film. Pick out stickers that are at least semi-transparent or are very small on a transparent background. Tape should be similar, transparent or semi transparent with small images. Contact paper should be semi-transparent. In all cases you can adhere these to clear leader or found footage. Cut the items small enough so that they will fit in the frame. With tape you can cut long and narrow lengths to apply to the film across several frames. As always work on film with the emulsion up and the sprockets to the left, working from top to bottom, left to right and don't block the sprockets! One interesting thing about clear tape is that you can also use it to stick things to the surface of your film. Take a piece of tape and put it sticky side down on the floor. Then stick it on your film. When projected the dust and cat hair and bugs you may have found look amazing. You can also intentionally take small pieces of fuzz or leaves or dirt or string and tape them to the surface of your film.

Sounds crazy? Not so much. Legendary experimental filmmaker Stan Brakhage created an entire film by sticking bug wings and plant matter to the surface of clear leader in his film *Mothlight* (1963). The luminary Naomi Uman taped cut-out pieces of film and yarn to her film in *Hand Eye Coordination* (2002). Of course, whatever you do you must be careful not to make the film too bumpy or it will not run through the projector. Even if you plan on optically printing your work, if it is too bumpy it will stick in the gate and you will need to manually advance the film

FIGURE 2.14
(*Left*) Packing tape applied to film. The tape has threads running through it that look somewhat like dental floss to the eye, but when projected create vertical stripes on the image.

FIGURE 2.15
(*Above*) A film loop with tape on both sides by Devon Damonte. Courtesy of the artist.

frame by frame (optical printing is discussed in Chapters 3 and 9). I was once told by painter, artist, performer and filmmaker Carolee Schneemann, in a conversation that also included M.M. Serra, that when Schneemann went to have her film *Fuses* (1967) printed the lab initially refused because it was too thick. She had layered multiple images on top of each other and painted and dyed the film so that it was much denser than an ordinary optical printer could handle. Only after much pleading was she able to convince the lab to print her original. The film would go on to be a phenomenon at Cannes and worldwide (Serra and Ramey 2007).

PRINTING ONTO FILM

Have you ever printed on a copy machine, ink-jet or laser printer directly onto a transparency? I have and it occurred to me that, if I could print onto that, I could print onto film. Of course, hand-made film guru Devon Damonte was way ahead of me and gave me some direction from his experience. What is so cool about this is that, if you are really precise with what you are printing and where you place your film, you can actually print things onto frames so that they move and change smoothly.

Supplies/tools

- A laser printer or copier that prints onto transparencies.
- Clear leader 16mm or 35mm.
- Scotch tape.
- Graph paper if precision is important.
- Glue (a glue stick is not messy or fumey and works great) (copy process only).
- Copier paper. The largest/longest the printer/copier will take is best.
- Text/images you want to put onto film.
- Scissors.
- A screwdriver in case you mess up and have to get your film/paper unjammed.

Process for laser printing on film

1. Analyze the machine to determine where the rollers are on the paper feed.
2. Develop the image you will print onto the film based on where the rollers AREN'T.
3. Tape your film securely onto the paper you will be printing on and make sure it goes through the printer. This can be accomplished without printing onto it by printing a blank page. Remember to orient your film so that it is emulsion up and sprockets on the left.

4. Print your practice image onto a blank piece of paper and compare it with your paper with film on it. This can be done by sandwiching them together, film on top and looking at them over a light table/box.
5. If everything is lined up, put your film/paper into the paper tray and print your image. If not, adjust your image until it lines up the way you want.

Process for printing on the copy machine

1. Bring the image/text you want to put onto your film with you to the copy machine.
2. Study the copy machine. Where are the rollers?
3. Tape your film to paper to avoid the rollers.
4. Run it through the machine. If it works, this is your template. If it doesn't, adjust.
5. Take your image/text and cut it out gluing it onto the film template oriented in the way you want the film to come out.
6. Print this onto a piece of paper.
7. Using that piece of paper, line up new pieces of clear leader over the printed image of the film template and tape them onto the paper.
8. Print onto the clear leader. If you wish to make several copies of the same thing you can reuse the template if you are careful when you remove the film from it. If not, print up another template and begin again.

CONCLUSION—CREATE

By now you're probably getting the sense that creation and destruction are intimately connected. The artist interview that follows is with a person named Devon Damonte who, as it happens, attended my Alma Mater, the Evergreen State College, studied with the same teachers and teaches animation classes there now. Although we missed each other (he graduated the year I began attending) we met in the greater Seattle film community in the early 1990s. Devon is inspired by texture, transparency and opacity. For him film really is a physical medium first and foremost—one that you handle *with your hands* as you *make it*. He is not interested in film for its representational qualities but for the way it can transform light as it is projected through it, with or without the aid of an actual projector.

Some of Devon Damonte's work can be seen on his Vimeo account at https://vimeo.com/user4815979. He currently teaches animation and experimental filmmaking at the Evergreen State College in Olympia, Washington, and continues to make and screen his work locally and internationally. Despite his protests at not liking people, he is a very nice and extremely generous person.

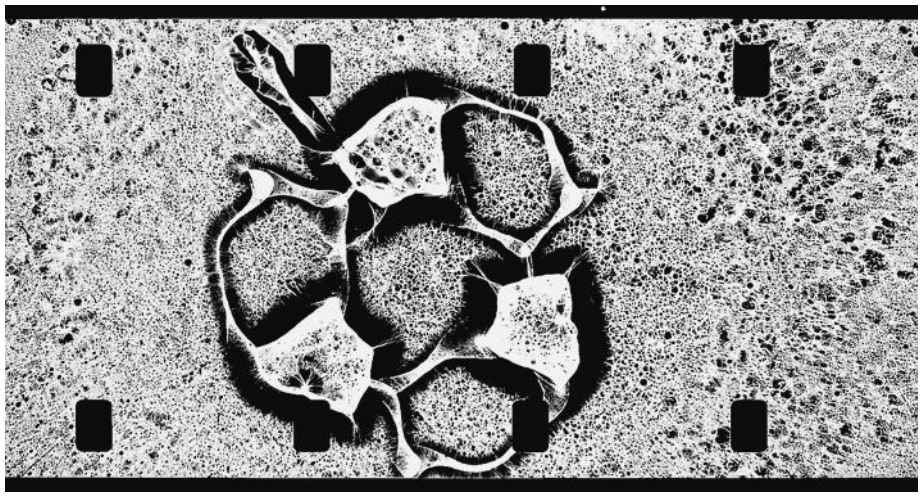

FIGURE 2.16
Contact printing with beach glass on 7363 by Devon Damonte. Courtesy of the artist.

INTERVIEW WITH DEVON DAMONTE

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a new media practitioner, a shaman, a performer? How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

Devon Damonte: I consider myself an artist, an experimental animator, a filmmaker, a supposedly extinct media fetishist, an obsessive-compulsive content provider, a crackpot crafter, a projection performer, an adhesive tape worshiper, also a teacher and curator/organizer (back in the old days we used to call it programmer, but now the kids giggle at that). To the guy next door, I'll generally say I work at the library (my part-time day job) because that's a lot simpler to explain. Years ago I realized that the specific acts that fill my practice mostly have nothing to do with what most people know as animation or even filmmaking. To get specific about it, most of the techniques have more resemblance to printmaking-in-motion or perhaps some odd high-speed bricolage. An example—recently I worked intently on a project for weeks in which I was carefully removing the paper adhesive layer of pink leopard-patterned washi tape (masking tape with printed graphics), then even more carefully washing the impossibly thin color washi layer, then drying, then re-adhering this layer onto clear 16mm leader with double-stick clear tape. So when you get right down to it, if you look too closely this is more like "art of the insane" than anything else! Yes I often don't even try to explain, depending on context. But I'm virtually always prepared, carrying some sample bits of footage with me, because holding and examining primary-source visual aids are my only hope of ever describing what I make. Even then, it's often too far

outside the box for many folks to grok. [Author's note: *grok* is a word coined by science fiction writer Robert Heinlein in his book *Stranger in a Strange Land* and it means to understand something so completely that you have a rapport with others about it and enjoy and appreciate it at a similar level.]

But perhaps that requires clarification—although I make this work with a vision as I see it, calling it names that fit my understanding and experience, I try to remain open to other perspectives and interpretations. This is an aspect I especially enjoy about making direct animation—I am a craftsperson making an object that can be experienced in a number of different ways. And though the primary intention of this object requires further contraptions and controlled environments to be experienced as time-based media, I often get the most satisfaction from "hand-to-hand" exchanges: pulling a strip of film from my wallet and handing it to somebody to hold it up to the light, to touch it and feel it and respond in some fashion.

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

DD: I got my start in film in a course at the Evergreen State College called "Experiments with Light and Sound" in 1987, taught by Sally Cloninger, Peter Randlette and Marge Brown, who became my primary mentors and remain so to this day. My path to this class is somewhat significant too—I left SF State for Evergreen in Olympia, Washington, because I wanted to do more printmaking and I love the Northwest (I was born in Tacoma, but grew up in SF Bay Area). At SFSU I had an incredible freshman year (in retrospect it was a very Evergreen-esque experience, highlighted by an intensive literature and philosophy course called "The Two Crazies: The Mad Scientist and the Mad Artist" taught by an English professor and a Chemistry professor, plus an amazing intro to printmaking class). When I was told I couldn't take more printmaking courses until I was an upperclassman, I set about finding a school where I could do more printmaking right away. That led me to Evergreen in 1984, where there was a hotshot young printmaking couple teaching, and an extremely liberal education philosophy. Unfortunately the printmaking studio closed due to budget cuts within a few months after my arrival, the hotshot couple moved to Idaho, and I was cast adrift. After a nearly disastrous detour through a Psych class, I landed in a summer TV Production class with my girlfriend, somewhat on a whim and probably mostly seeking easy credits rather than a real interest in the subject. I wasn't prepared for professor Sally Cloninger, a profoundly brilliant and inspirational dynamo who looks like Harpo Marx and runs her classes like a Busby Berkeley production (FULL CONFESSIONAL NOTE—I LOVE THIS QUOTE IF I DO SAY SO MYSELF, BUT I MUST ADMIT IT'S ALREADY BEEN USED IN PRINT—in "INTERMITTENT" catalog from Museu do Chiado, essay by Coco Hardwater) and who probably exudes more inspirational integrity than anybody I have ever known. This experience completely

changed my life forever. Sally was hatching the first "Experiments" class (which still continues largely the same, now known as "Mediaworks") and many of us from the summer TV Production class followed her for the rest of our educational careers and beyond. As a component of Sally's class, we each had to specialize in an area, and I stumbled into learning animation taught by another educational genius, Margery Brown. There I saw my first Len Lye, Brakhage, Breer, McLaren, Mary Ellen Bute and much, much more, and my awareness exploded. Our first animation assignment was cameraless animation, and I asked Marge if I could put rubbings on film, and she said "I don't know, try it!" That encouragement was all I needed to set me on the path that is still going stronger and stranger than ever, now twenty-seven years later.

My practice has always since the very beginning been a dynamic marriage of three disciplines: making, showing/seeing and teaching/exchanging. For me, any of these taken alone renders them virtually inert and meaningless, but in concert altogether they create the universe, unlock the Oneness.

I work utilizing an almost scientific approach to the experimental process of trial and error and aesthetic refinement toward a specific conceptual framework: constant research via screenings, readings, travelings, experiencings; and teaching in as many varied contexts as possible, from college courses, to community workshops, to informal gatherings of friends.

While my processes are unusual by most standards, using tools in speakable ways not recommended by any manufacturer, most of my techniques are really quite simple, and not original to me—many of my "innovations" just stem from my being crazy enough to try seemingly impossible methods, and then to rigorously refine and develop these impossibilities into somewhat repeatable phenomena.

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

DD: I consider my work a collaboration between the materials and me. The material includes the medium—16mm film leaders for example; the tools to make work with the medium—such as tape, inks, scratchy devices and various crafty artifacts; and the technology required to share the work with others—a 16mm projector, electricity and a surface to project onto. Often my visual ideas will start with some sort of material artifact suitable for cavemanic movie craftifications—a snakeskin shedding, or animal-patterned washi adhesive tapes. There the dialogue begins: I wonder what that would look like? How will it interact in size, patterns, rhythms, frequencies, textures, opacities, etc. with the 16mm film and projection technologies specs? So the collaborative conversation that develops is very much like a scientific process, with hypotheses and experimentation, observation, adaptation, refinement. And then, while this material dialogue ensues, there's almost always simultaneously a conceptual maceration occurring, ideas about meaning and relevance, connections to the Oneness and bigger ideas and bigger thinkers and warriors gone before.

My work is about experiencing aliveness via moving images. I've always felt that using cinema as an example of "the work of art in the age of mechanical reproduction" is a myth, and misses the point of this medium completely. Each piece of film is a unique artifact and an original "primary-source document". Each strip, each reel possesses its own history and its own distinct and particular aura. Further, every projection is a unique experience that cannot ever be repeated. We're casting light through spaces of air—it's a different recipe of molecules every time, and, as David Suzuki brilliantly elucidates, a few of those molecules have been shared with every human who has ever lived. Even beyond that, since this is time-based media, as moving-image-maker I also get to have some sway on a chunk of time in my audiences' lives, and I try to take that responsibility seriously for potentially changing realities in some positive way.

Jeanne Moreau once said something that has influenced all my work—she observed: "I never come out of a film the same as I went in. Each time I discover new capacities for feelings and emotions I never knew I had." When I saw my first Len Lye movie in 1986, something connected to my entire being—Lye would call it the "old brain". Beyond seeing in a completely new way, a way that makes infinitely more sense to my old brain than any photo-realistic vision, but I FELT his movies, body and soul. It definitely helped that alongside lots of Lye I was seeing Breer and Brakhage, Germaine Dulac and Dziga Vertov, and that this experience came in a carefully crafted academic environment, fueling assignments to make movies and learn the ropes. So in my seeing Len Lye and experiencing this awakening, yes it inspired me to attempt to create similar transcendencies in my own work.

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

DD: I show my work wherever I can, whenever I can. After a coupla decades showing my films, I can now be a little more selective, and it's really nice to be asked to show, instead of always having to submit and beg (I definitely served my time doing this), so now I try to say yes as often as possible. I also believe it's especially important to be there in person at screenings of my work, and my presentation choices have evolved in concert with this belief. For example, my latest piece *Auroroborous* is a multi-projector 16mm performance, showing several loops of original hand-crafted material, and manipulated with "projection nozzles". It's not something that can happen without me there to do it—I can't ship this around in a box. And I think this is a crucial element for experimental media in general—it's old-fashioned interactive experience: cinema expanded beyond a passive trip to consume and escape at the multiplex. Many of my best peak experiences in cinema-going have involved connecting in-person with the makers—from grasping Stan Brakhage's giant hand, to giggling uncontrollably like a schoolgirl Beatles fan when meeting Bärbel Neubauer, creator of direct animation's all-time masterworks. The creators of many of my favorite contemporary films have become dear friends, and I'm

honored to be among such a small community of mostly very kind, generous, freaky and fabulous folks.

I'm also lucky to have a small studio space in the back of a great all-ages venue called Northern in downtown Olympia, Washington State. Northern has an extremely open and liberal policy about people putting on shows, so I try to organize my own screenings frequently. It's often tricky for me finding a balance between organizing shows of others' work and showing my own—I'm kinda wary of doing too much "vanity programming". But again, this is a pretty small, beautiful community, and mostly everybody knows everybody, and most of us are organizing shows too so we're all showing our best friends' best stuff, and it usually works out pretty well.

When I think about it, I guess I'm always aiming for re-creating for others my own cinematic "big bang" moment of seeing my first Len Lye film. It's a moment as indelibly etched into my whole being as was the time for Lye as a boy when he stared at the sun until it became a "big black ball". I want to blow people's minds with synaesthetic dazzle to forever expand their awareness. I want people to experience my work in whatever way they want, and while I post work online and share in various formats (I love pulling my films out of my pocket to show friends in my hand, playing upon my device), my strong preference is always for people to see my work projected onto a big screen, watching together with other people, preferably including me at the party.

KR: And finally, your chapter is called "Film-create" (and is about additive direct animation). Please elaborate how you came to such an activity? Are you part of a community of makers (either locally or internationally) who communicate with each other about their work and get together either virtually or physically to discuss/show/celebrate? Where? When? How? What happens?

DD: So wait, "ADDITIVE" direct animation only? I don't get to subtract too? I guess that makes sense, I am a collagist bricoleur maximalist hoarder, I shan't deny it. Which I suppose leads nicely to how I came to this activity, which is that I believe, here in our modern times, obsessive-compulsive hoarding in one form or another is a normal, healthy state, and anything else is messed-up denial. How could any sane person respond in any other way than attempt to manipulate and conquer all our STUFF? For me, there's something primal and cavemanic about collecting and feathering our nests, and I'm somehow fortunate to be in the position of artist where my job is to attempt to make new stuff from all the existing stuff, hopefully wresting new meanings for us all in the process. My Dad was a packrat, my Mom not so much though she's got the kindergarten teacher's appreciation for creative reuse. I am a natural-born rubber, like my father before me, and I'm only lately realizing how rubbings are kinda the epitome of indexicality, creating primary-source documents of experiential textures. So that leads very naturally into my penchant for film originals, unique loops, one-of-a-kind cinematic artifacts (and rubbings, especially large-scale ones, also end up in long rolls, much like long spools of film). Then somewhere along the line, the sticky-tape obsession kicked in

(another material found in long rolls!), which continues rampantly, rabidly, unrepentantly to this day. Can't get enough TAPE (which also represents a great symbolic icon for analog media in general, as well as fertile ground for AV geek puns)! Here, too, I think I can blame my AV geek Dad for fueling this fire—his bins labeled "things that go 'stickum'" were always my favorite for rooting through.

Yes, I am very lucky to be part of several communities of makers, and to regularly exchange our work and communicate on various levels. This is very important—maybe the most critical thing of all. But perhaps I should preface this part by admitting that I don't really like people. Generally other people bug me. And most of the bad stuff that happens is all their fault. In other words, I am somewhat anti-social, and often somewhat painfully introverted and overly sensitive. But I had to admit a while ago that we humans are social animals, and to be healthy we need each other, and making art really does achieve higher purpose and meanings when shared with others. So I have to work pretty hard to force myself to make any social encounters happen, and I made a conscious effort beginning around 1999 in Boston to start creating opportunities for critiquing work with peers. I might mention here too that for over a decade I was working at media arts non-profits for my day job, so these organizations often also fostered communities of creative exchange (such as the "Rough Cuts" work-in-progress series I helped create at Boston Film/Video Foundation, where people like Ross McElwee debuted and discussed new work).

My personal efforts toward critique groups evolved into informal workshop-like social get-togethers, which were soon dubbed "Crackpot Crafters". The best description of this group is "it's like a quilting bee for film freaks". I'm pretty sure Jo Dery said that, and she may also have cooked up the Crackpot Crafter name. Jo is an artist/filmmaker/animator who then lived at the Dirt Palace in Olneyville, Providence, Rhode Island, which is an incredible hotbed of creative activism. In the midst of the Crafters' early gatherings, Mme Dery cooked up a "24-Hour Moviemaking Experiment" in which about a dozen of us stayed up all night making hand-made movies, and then showed them all at a big party with bands at the end of the sleep-deprived night/day (we later took this concept on the road for a cross-Canada to Olympia mini-tour). Also there during that time Dirt Palace veteran Xander Marro's "Movies With Live Soundtrax" summer extravaganzas were in the last days of a very long run, and I must say that participating in and attending these shows remain some of the greatest events ever in my life. It's interesting to look back on the origins of Crafters, the many intersecting creative communities, the critical role played by power of place, and the relevance to current trends in "art as social interaction" and "relational aesthetics". The two factors that were my immediate impetus for starting the Crafters were: firstly that I knew I'd be moving from an amazing penthouse warehouse loft in South Boston and I wanted to share it with more people before I left; and secondly I'd grown weary of teaching my direct animation classes for struggling non-profits who had to keep raising tuition for my classes, so that my students were increasingly the type who only wanted

to know "How do I get my film into Sundance, dude?" So I decided to take all money out of the picture completely and give it all away, which worked out much better, and formed strong, deep and lasting communities of creatives.

Crackpot Crafters continues, still going strong thirteen years later, currently meeting somewhat irregularly while I'm teaching, but mostly monthly, at Northern in Oly. Besides starting at my studio at the Distillery in Southie and the Dirt Palace in Providence, Crafters has also met at Moody Station Studios in Waltham, Massachusetts (home to the good makers at Handcranked Films), dearly-recently-departed 911 Media Arts in Seattle, and Olympia Film Society's Film Ranch here. The latest local incarnation of Crafters now includes faculty, students and alums from Evergreen as well as local video producers and graphic designers, and in 2011 we created our first major collaborative work, an 8-minute 16mm direct animation film entitled "The Artifacts of Life", made entirely from elements of once-living things. More recently we've started doing big group shows called "LocaLoops" with a dozen or so artists and musicians, running 16mm loops on as many as eight projectors simultaneously, projecting on many custom screens all around the room at Northern, including our latest addition: a series of retractable small scrim screens designed and hung around the room by former Seattle artist Carl Smool, now hanging around Olympia.

I find that maintaining critical exchange and collaboration among my fellow artist filmmakers is almost never easy, often infuriatingly frustrating, and it always yields fruitful opportunities for growth, both personally and in developing my work and practice. And it doesn't get any easier either the longer I do it—seems to always be difficult in new ways. But it is an essential element of becoming a whole artist maker film person.

Other topics to include but not quite covered by questions—$—Getting paid and paying artists (and giving it all away free)

What was the other one? . . . There was something else. . . .

Thanks for the words of encouragement, and great follow-up questions. I'm wondering about maybe inserting a qualifier in the "I don't like people" rant—there are, of course, a few notable exceptions. Anyhoo. . . .

KR: About your a-ha experience seeing Len Lye. In other writing I have referred to this kind of moment as a conversion experience, a moment when the individual becomes indelibly marked by the work and decides to pursue making such work themselves. It is something like falling in love or like a religious awakening but the belief system involved revolves around aesthetic experience that is both personal and communal. Can you be more specific about this moment for you? When was it? Where was it? Who were you with? What did you do afterward? Had you made films or art up to that point? If so, how did your work change?

DD: Yes when I saw Len Lye films for the first time, must have been fall 1985 or 86 in Sally Cloninger's "Experiments with Light and Sound" course at the

Evergreen State College, it could be described as a conversion experience, though I'm not wild about the religious connotations of that word. And yes it was like falling in love, and yes it involves expanding my aesthetic belief system in both personal and communal realms. And it's more than all that too because the experience—the opening of those "doors of perception" (to get all Huxley-delic about it)—it's about more than me, beyond my individual self. Len Lye would call it tapping into the "old brain", which is a big part of why he's the perfect guide for this journey—his films stand alone, as among the greatest art in any media in his (or any other) century. And though he's still generally under-appreciated, his work endures, stoking ever-brighter fires of young inspiration. Hence I believe that in the fullness of time his contributions will be better recognized. But also because in studying Lye, the deeper you dig, the more wonders are revealed, from his monumental kinetic sculpture *Tangibles*, to his giddy poetry, to his batik paintings, to his heady philosophical writings such as "The Absolute Truth of the Happiness Acid" (which incidentally had absolutely nothing to do with LSD)—it's a brave new world apart, a calling to higher levels.

It's strange to be asked to recall my "conversion experience" in specific detail, because remembering now I see how I was perfectly primed and privileged in so many ways for my first intensive exposure to experimental media. Group chemistry is a fascinating phenomenon, and the people with me in that supercharged class where I first saw Lye—alongside Breer and Brakhage and Dziga Vertov and William Wegman and Germaine Dulac and so many many other greats—it was an extraordinary gathering of minds and talents, a remarkable number of classmates with whom I am still friends today, lo these decades later. I had made quite a lot of visual art before that (drawing, printmaking, ceramics), and some video work (a student smattering of quasi-experimental home movies, plus some TV studio class stuff), and lots of music in various forms since a wee tyke, and I may have somewhere been briefly exposed to Super-8mm (I did some photo darkroom classes in middle school too), but I think that class was my first touch of 16mm. My dad had a higher than average AV geek knowledge and usage, so it wasn't totally foreign to me. But I don't recall any flash of moment where I decided "this is what I want to do for the rest of my life". It almost seems like it was beyond any free will decision-making, like the question wasn't even relevant after that, like obviously I wanted to make more film, how could I not? For me it's been a steady flow since then, not always easy, but a naturally irrepressible impulse. And what was set in motion was not just the urge to create films, but the solid triumvirate of: making, studying and showing that continues in equal measure to this day. Which leads nicely to your next good question. . . .

KR: The second question that you raised is about the economics of the film avant-garde (for use of a better catch-all term for what it is we all do). Getting paid, paying others or giving it away for free. Other writers (sociologist Todd Bayma for one) has likened the activity of the film avant-garde to economic irrationality because it doesn't subscribe to either art or commercial market practices (although

some artists have been able to monetize their work this way). I have argued a more complex understanding of the screening practices as a kind of gift economy that can lead to economic benefits (teaching, grants, etc.) but is not predicated on this eventuality. Please tell me about your own take on the "economics" of your practice.

DD: I like your notion of "gift economy" in regards to the film avant-garde (much of it would surely fit Lewis Hyde's studies), and it's certainly economically completely irrational, crazy and downright reckless. But it must be noted that all this economic gifting and beautiful irrationality is afforded by our social positions of financial and other privileges. Film avant-garde is an upper-class sport. We're hopefully among the more enlightened and socially progressive (if not downright radically leftist) among the upper classes, but we're still virtually all coming to this from positions of privilege across the spectrum, and anybody who denies this is either lying or deluded.

I showed a recent work *Stalking the Wild Washi* at the Portland, Oregon Experimental Film Festival last year, and I looked around the audience, delighted to see an eager packed house filled with avant-garde cinema luminaries. And I gradually realized that there were people from across the globe, many from Chicago and New York and other far-flung cities, some from South America and Europe, and, as far as I know, none of us had our travel paid, almost none of us were paid anything for showing our work there. So a room of 50–75 people, not only had many of them paid hundreds if not thousands of dollars to be there, but also, on top of it, many of us had invested hundreds or thousands of dollars into our work, and years of our lives, and when our masterpiece is done, we give it away. And we even say "Sure you can charge admission" for our gift and still you don't need to pay us a penny. What fabulous, radical economic insanity is that?! But to complete this story, I must confess in full disclosure that a few weeks after the festival I did get an unexpected $100 check, thanks to the dogged lobbying efforts on my behalf from a fellow filmmaker, and I am very grateful for this money, and it probably didn't even cover my modest expenses coming from only 100 miles away. To provide further details in hopes of demystifying how all this works in the real world (counter to the frequent norms of privilege where these "money matters" are dealt with in secret) . . . I submitted my work to the festival and waived the entry fee because I had showed with them before. My memory is sketchy but as I recall I wasn't notified whether or not I was accepted with the main batch but I kept quiet and kept hoping, and I was delighted to soon learn I was selected to show on a special program with a premiere by one of my favorite filmmakers, Jodie Mack. Can't remember if I offered or was asked to also teach a mini-workshop at a gallery opening event as part of the festival, which I was happy to do. Since I was doing extra duty, I asked for some money to help cover my expenses. The festival person said they'd ask the director and get back to me. I think I asked once more, and I think the answer was something like "We think we can give you something but we're not sure yet and we're not sure how much." I never heard again after that, and I didn't pursue it, so it

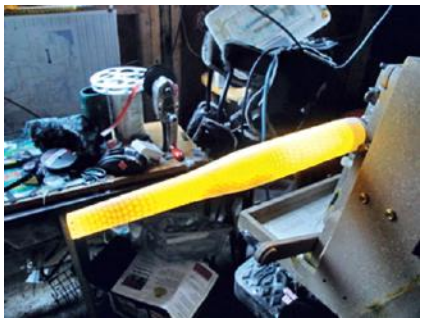

FIGURE 2.17
Devon Damonte's "film nozzle". Courtesy of the artist.

was a nice surprise happy ending to get the check later. Oh and I should add that, as is so often the case, several of the festival organizers are good friends, so this makes the economics even more delicate.

It is a unique community and a unique practice of the film avant-garde. Virtually every filmmaker I know also regularly organizes screenings, and regularly shows their own work near and far, usually all at their own expense. Imagine if every painter, watercolorist, silkscreener, etc. also regularly ran their own alternative gallery spaces. Sounds rather cool actually, but it would make a crowded exhibition scene.

KR: Is there a gift or recipe or assignment you would like to share with our readers?

DD: I like how your word choice is active and almost commanding for this project: "Break the machine!" Here's your "assignment"! Get off your ass and do it already, you lazy slacker. . . . TURN. OFF. DEVICE. NOW! And look up! Tilt. Head. Upward. Good!

So . . . I suppose the "assignment" part is to expand the choice of photocopy/printed materials. Because the results are only as good as what a person picks to put on there. If you want it more spelled out as a "project" or "assignment", let me know and I can write up a preamble—I generally leave these things slightly more open-ended. I'd probably do either: "make your own hand-made 16mm film credits" or "make your own hand-made, personalized SMPTE countdown leader". Or if you don't need that aspect, you can use this as is. Let me know.

Oh yeah, and I would want to note somewhere that I am not claiming to have "invented" this technique. I have worked hard to develop the best, most effective techniques for this application, and I'm always refining it with help from a multitude of crafters everywhere sharing information, but I wouldn't claim any sole authorship. In fact, there's another great filmmaker and direct animator, Donna Cameron in New York City, who actually has a patent on a particular

application of this process! I discovered this by surprise at a screening in New Orleans a decade ago when by happenstance we were showing on the same night and I started teaching folks the tape-lift technique and asked if she knew it and she replied that she not only knew it, she also held the patent! Luckily she wasn't feeling particularly litigious that night.

Thanks,
DD

Tape-lift image transfer

Summary: a way to grab imagery/text/patterns off photocopies or other printed matter onto clear tape, which is then stuck onto film leader for projecting.

Clear tape onto image side of photocopy (including color copies), turn over and wet the back with water, gradually rub paper fibers off leaving just image/toner/ink, dry, stick tape onto clear or color leader and reinforce with tape splicer (because often most of the stickum on the tape is covered over with photocopier ink).

TAPE-LIFT IMAGE TRANSFER RECIPE

Select imagery for transferring. Contrasty photocopies work best, especially black and white but color too (though be aware of copier halftoning patterns—check it with strong magnifier/loupe, at least 8× or better). Other printed matter sometimes works too; try it! NOTE: it must be non-water-based printed matter, so ink-jet prints don't work (though photocopies of ink-jet prints will work).

Put clear tape on top of copied/printed stuff—sticky side on ink/toner side. Half an inch width works perfectly for 16mm film. Use clear tape, not "magic" or frosted. Not all clear tape works—try a sample first. I've had good luck with Scotch, Office Depot and Western Family brands (and sometimes the latter claims it's non-petroleum-based!). Advanced practitioners can try tape variants—printed decorative tapes, washi, teflon tapes, etc., but stick with clear for starters, hey that's funny!

Burnish it down really well. I like an agate burnisher, but you can use a plastic burnisher or fingernail or marker butt or giant squid beak or whatever hard, smooth thing you like. Life is all about burnishing. Now you know. Doesn't matter so much what you do, what you wear, who you are, as long as you be sure to burnish it up real smooth and pretty.

Soak for 30+ minutes or so ideally (the tape-lift, not your life). Can get away with 10 minutes if you're impatient; might need to briefly re-soak after peeling first layer.

Carefully peel and rub paper off back with fingers and/or toothbrush and/or sponge (rubber cement picker upper also works). Depending how much paper fiber is rubbed off, different effects are achieved. Leaving lots of fiber gives a

compelling "fuzzy edges" result. When most of paper is gone, rub more carefully so as to not rub off ink. It's usually possible, with care and practice, to rub off virtually all the paper fiber leaving only toner/ink. Continued rubbing will remove/lighten the toner image too, so quit when it looks good. Obsessive-compulsive rubbing beyond that will eventually remove the ink and adhesive too, and then probably your epidermis, and eventually you'll dig to China, but I recommend moving on to next step before you get that deep.

Rinse and let dry, adhesive side up. Some tape will turn whitish/cloudy when wetted, but then it generally dries clear.

When there's enough "blank space" on source imagery, such as with titles with black text on white/clear background, as the tape dries the adhesive in non-image areas becomes sticky again. So this type of material can then be stuck directly onto 16mm film. If there's lots of toner/ink coverage on image source material, add a layer of double-stick tape on image side of transferred tape to adhere it to the film. Then burnish it all down onto the film so it's well-stuck all around. Some trimming may be necessary, and splice-tape down any loose edges. If there's any trouble, add more tape, burnish again, trim it cleanly. More tape generally fixes anything in life that burnishing can't. Yep, just "stick with it" till you gets it right!

FURTHER NOTES

Can also put on backside of black leader and scratch through to reveal (especially nice for titles)—for this, be aware of lettering orientation, might need to print backwards or "mirror image" on copier to get it to read right. May want to print/photocopy white lettering on black background for this effect too—use "negative" special function button on the copier.

Beware: this tape-lift business is generally a decidedly non-archival technique—different adhesive tapes do weird things over time. Don't even get me started about my transparent duct tape film *Duct & Cover*—oy what a nightmare! I went back to some other regular clear tape-lift transfer title credits footage about five years later and the toner ink was beginning to migrate around in the mucilaginous tape adhesive goo!

I usually use ½" tape and carefully stick onto 16mm so it doesn't cover the sprockets but comes right to the edge. You can also use wider tape to transfer more imagery at once, then trim to size.

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CHAPTER 3

Optical Printing

Getting to know the JK optical printer

Optical printing is reprinting already filmed images onto film. It is a way to move one film size and/or type onto another. It is a way to change the speed of a series of images, including moving film that was shot at silent speed (18FPS) to sound speed (24FPS) so that it projects at the speed the original action took place. It is a way to preserve fragile images by transferring them onto new stock. It is a way to create superimpositions, dissolves, traveling mattes and other optical effects. Until the advent of digital effects and compositing it was used extensively in the mainstream film industry to create title sequences and a whole variety of optical and special effects. In the 1960s it was embraced by experimental filmmakers as a creative tool. In their 2010 book *The VES Handbook of Visual Effects* authors Zwerman and Okun differentiate between *special* or *practical effects*, those that can be done in camera/during production, with *visual effects*, image effects that require laboratory processing. This chapter is about experimental filmmakers and *visual effects* made through a very particular process called *optical printing*. However, these processes/technologies evolved out of the industrial practice and in order to fully understand the tool it is essential that you comprehend its history and the way it made its way into the avant-garde.

(A BRIEF) INDUSTRIAL HISTORY

This history of special effects in cinematography goes back to the very origins of cinema. The people who made and used the first cinematographs were part scientist, part inventor, part artist and they weren't just interested in capturing something like "reality". They quickly realized that the tools of cinema could convey images that humans could imagine, but never see. The earliest widely cited use of a special effect was in *The Execution of Mary, Queen of Scots* (1895) shot at Edison studios. During production, the camera was stopped as the execution was about to take place and the actress was replaced with a dummy who lost her head (Okun and Zwerman, p. 4).

One of the earliest experimenters in creating fantastical special effects was George Méliès. Before working with film, he was a theater owner. As a part of his performances he staged illusions and exhibited magic lantern shows. He

purchased one of Edison's kinetographs with the intent of photographing his performances but quickly realized that, due to the camera's ability to move forward and in reverse, he could create multiple exposures and slow and fast motion. Combining these tricks with stop-motion animation as well as matte work (masking off part of the frame so that it does not get exposed—filming, rewinding and masking off the already exposed area and filming something in the unexposed area) he created the legendary short *A Trip to the Moon* in 1902.

An early pioneer in American cinema, Edwin S. Porter used double exposure to further realism in his *The Great Train Robbery* (1903). In the scene inside the railway station, a moving train is superimposed over a window, so that it looks as though it is leaving. Two shots later, film shot out of a moving train is superimposed over the set of the interior of a train car to simulate that the car is in motion.

Another landmark film that made use of in-camera special effects such as matting, superimposition and stop motion was Dziga Vertov's *Man with a Movie Camera*. Completed in 1929 with support from a fully developed Soviet film industry, nevertheless it continues to be hugely influential in part because of its radical aesthetics used in service of a radical message. These tricks were all performed in camera and were the result of a filmmaker or director/cinematographer team experimenting as they made films.

In order for optical printing—the compositing or rephotography frame by frame of film—more stable cameras and projectors were required. In 1912 Bell & Howell began manufacturing cameras using registration pins, a pin that "holds" the film in the gate while the shutter is open so that each frame is exposed on precisely the same area between the sprocket holes as the last. Part of the flutter in early cinema, where the frame appears to move up and down, can be attributed to this, although it is also the result of the hand cranking of the camera. Having used one of these early hand-cranked 35mm cameras myself (for my 2006 film *fall*—thank you Joel Schlemowitz) I can tell you from first-hand experience that keeping a hand-cranked film camera steady, even when it is bolted to a tripod, is not easy.

The history of the development of visual effects in cinema is, like almost everything else, the product of directors and cinematographers pushing for more innovative shots. Until the early 1960s, most major motion picture films were shot exclusively on sound stages. In order to create authentic-feeling exteriors and motion shots, *process photography* was developed whereby backgrounds were projected onto large screens behind actors and sets (also called *rear screen*) or live action images were projected onto small sets (Okun and Zwerman, p. 6). As early as the 1930s studios were experimenting with *blue screen* (the predecessor to *green screen*) to separate the actors from a blank background and enable the effects coordinator to create traveling *mattes* so that a previously shot background could be composited through optical printing. Traveling mattes are positive and negative mattes that block out the image area during optical printing. There is more about this later on in this chapter.

Optical printers were developed commercially in the 1920s by the DuPue company in Chicago but until the 1940s most of those in use in the industry had been made in-house by their camera operators and visual-effects teams (Egbe and Woodward, p. 2). During World War II through the intermediary of Eastman Kodak, Linwood Dunn (in-house effects specialist at RKO) was assigned the task of designing a standardized, easily mass-produced optical printer (Dunn). Although studios had been using machines designed by their technicians up to this point, the Acme-Dunn optical printer, as it came to be known, soon dominated the industry. Besides helping to fund its invention, the US war propaganda machine was a large purchaser of these printers. After the war they, like cameras and other post-production equipment and even raw film stock, created a pool of surplus equipment that helped to jump-start the independent experimental and documentary practice in the United States.

AVANT-GARDE HISTORY

The optical printer became a part of the lexicon of experimental practice in the mid-1960s. Carolee Schneemann remembers using one at the London Filmmakers' Cooperative on the production of her film *Plumb Line* (1968–1971). Other filmmakers such as Stan VanDerBeek, Jordan Belson, the Whitney Brothers, Hy Hirsh, Will Hindle and Peter Rose manufactured optical rigs to fit their own needs. (There is an interview with Rose and images of his printer in Chapter 9 of this book.) Working from within the special effects houses of the LA film industry Pat O'Neill began to make extraordinary avant-garde films. By the 1970s Jaakko Kurhi began to produce tabletop optical printers that worked with a Bolex 16mm camera (the workhorse of the avant-garde film world). Relatively inexpensive at around $5000, these soon became standard equipment at cooperatives and emerging film programs at universities throughout the United States and Canada.

The first time I used an optical printer was at the Evergreen State College in Olympia, Washington. It was love at first sight. After I graduated, by some strange twist of fate, a filmmaker stored her optical printer at my house in Seattle, Washington, for over a year. I was able to experiment with it at will and ended up printing my first film, *Story of Sarah* (1993), on it. Although I planned to make use of the optical printer at Millennium Film Workshop (they still have one, New York City denizens, and they give classes on it! http://millenniumfilm.org/), working in the film business took up all of my time and so it wasn't until I began attending Temple University in Philadelphia, Pennsylvania, that I really began optical printing as a primary tool of film-making.

This was in 1996 and, although I was told that the school had an optical printer, it wasn't until I arrived that I discovered it was taken apart and in storage. As it turns out, this was to my advantage as Frank Sauerwald, the school's camera repair guru, handed me the pieces and said, "See what you can do." I put the whole thing back together and was able to print my next

film *Razed by Wolves* (1998) on that machine. The JK limped through that production but was deeply in need of a return to the mother ship and the ministrations of its maker, Jaakko Kurhi. So, in late 1998, I flew the device to his workshop in Oakland, California. Meeting him was like standing face to face with a real life Geppetto, complete with the very complicated spectacles of a watchmaker or diamond cutter. If I had only had a cellphone camera I would have snapped a picture but I didn't even own a cellphone at that point. Jaakko fixed up the printer. Unfortunately, my work with the printer was gaining the attention of my peers as it was being shown in film festivals and their protests necessitated moving the JK back to the school.

Being without an optical printer in my own home felt wrong. That summer I attended the Flaherty Film Seminar as a fellow and met someone who was going to change my life, Bill Brand. Besides the major motion picture industry, another aspect of commercial cinema that began heavy use of the optical printer was archival restoration and reproduction. Bill Brand of BB Optics, an artist and experimental filmmaker, has made a business out of printing archival prints for artists and museums. He has taught classes in film archivism to graduate students at NYU and he has also brokered the sale of more than one optical printer. So it was in 2000; he facilitated my purchase of a K-103/104 hybrid optical printer with 16mm, Super-8 and Regular-8 gates from a poet somewhere in Virginia (Figure 3.1).

FIGURE 3.1
My very own model K-103 JK optical printer in my home studio. You may refer back to this picture as I describe the various parts of the unit.

I still have that printer and I have made a number of films with it. Over the years my facility with the device has grown, so much so that when Brand saw my 2009 film *Yanqui WALKER and the OPTICAL REVOLUTION* at Anthology Film Archives he asked, "Did I print that?". While I contemplated interviewing myself for this chapter, you are getting enough of my perspective and philosophy in this book already. In 2012 I visited Bill at his studio and took pictures of his devices and talked and drank delicious coffee for hours. He has always been very generous with his time and his expertise, and so I am featuring an interview with him at the end of this chapter. What follows are some basic instructions in optical printing. The instructions assume the use of a JK optical printer. Other optical printers such as the Oxberry and home-made printers will be discussed when we will come back to optical printing in Chapter 9. What follows is a discussion of the JK optical printer with instructions on how to operate it.

JK COMPONENTS

There are a number of different versions of JK optical printers that you may encounter out there in the world. Some of them may have been converted to use DSLRs instead of a Bolex for capture (Figure 3.2). For the past ten or more years, it was possible to purchase a new JK with adapters for a DSLR as well

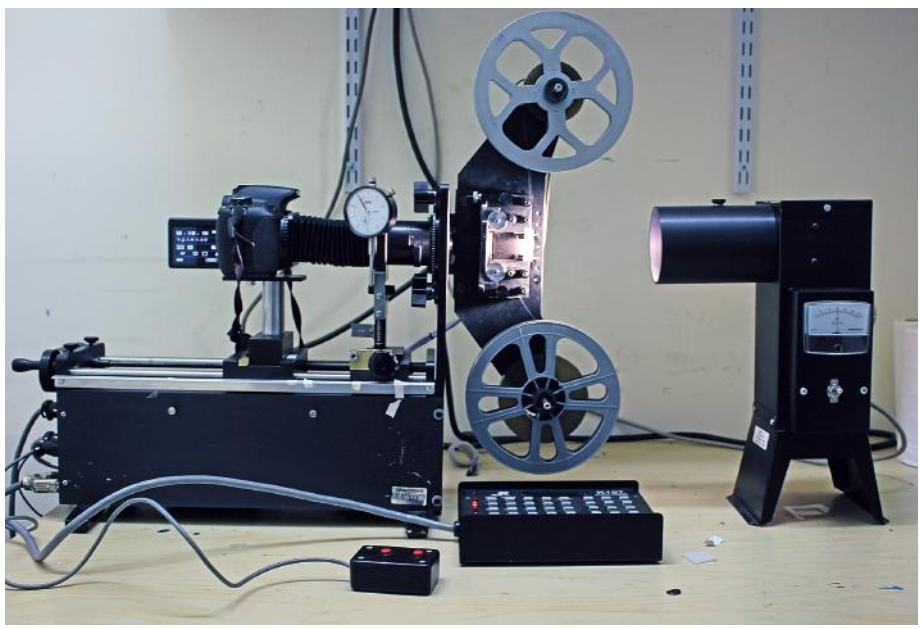


FIGURE 3.2
Courtesy of Lauren Cook, this is a picture of the JK at the University of Hartford that was modified to use a DSLR instead of a Bolex.

as have your older JK adapted to shoot with a DSLR. As we move through these instructions, you will hear me referring to differences in the set-ups, motors and sequencers, and, when this difference is crucial to understanding how to use the machine, I will include images to illustrate. What follows is a list of the major components of the device.

Camera

The JK uses a Bolex H-16 or Rex 4 or 5 to rephotograph film. The spring-wound motor has been disengaged (and should never be engaged) and the winding arm has been taken off. A motor has been attached to the 1:1 drive and this should be the ONLY way you advance the camera. You should NEVER take the motor off the Bolex. The camera motor will either have a single frame and continuous-run option as well as direction options directly on this motor (K-103) (Figure 3.3), on a wired remote (Figure 3.4) or on the back or side of the rails (K-107/108) (Figure 3.5). Besides the footage counter, all Bolexes have a frame counter (Figure 3.6). This is useful because it directly correlates to how many frames have gone through the camera. If the camera runs backwards (to reverse for a superimposition say) these numbers run backwards as well. To see this counter in the darkness of most optical printing rooms is why I recommend a head lamp or small flashlight.

Bellows/lens

There is not a standard lens on the JK. Instead there is a bellows with a lens element attached (usually a 50mm). This are the same type of lenses that is on enlargers and can be interchanged if necessary. If you want to do some close work you can swap out for a 75mm. If you need more room you can try to find a wider lens, although these are more difficult to come by.

If you've ever used extension tubes or a bellows on a still or motion picture camera then you understand the theory behind how this works. So bear with me while I explain it to everyone else. In most photography you are trying to fit a very big image onto a very small picture plane. Thus you need to refract the light so that it hits a small space clearly and the space between the place where the light beams cross is through the iris of the lens. In order to make big things small that light needs to cross very close to the picture plane. Thus the distance between the iris and the picture plane is small. If you are trying to make something small like a 16mm frame go onto something the same size, another 16mm frame, the distance between the object (the projected image) and the iris needs to be about the same as the distance (with a 50mm lens) between the picture plane and the iris. The bellows allows flexibility. See Figure 3.1 or 3.2 for a visualization of this.

Side effects of extending the distance between the iris and the picture plane are that exposure times must increase because the light has farther to go and that the depth of focus significantly decreases. That is why you have really just a hair's breadth of focus on the JK. That's OK. If your depth of focus was too

FIGURE 3.3
My K-103/104 optical printer (has parts from both).

FIGURE 3.4
A wired remote from the K-105 at Emerson College.

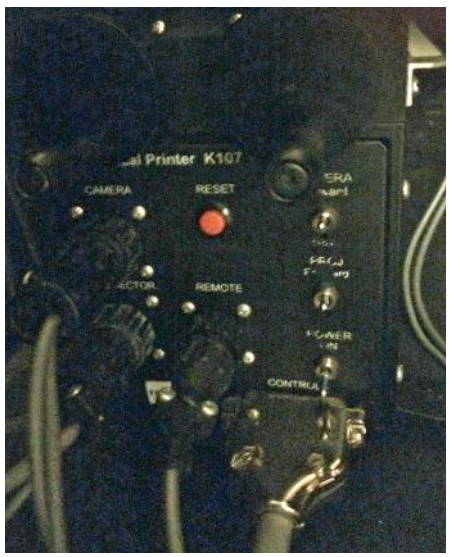


FIGURE 3.5
Back side of the rails on the K-107 at Emerson College.

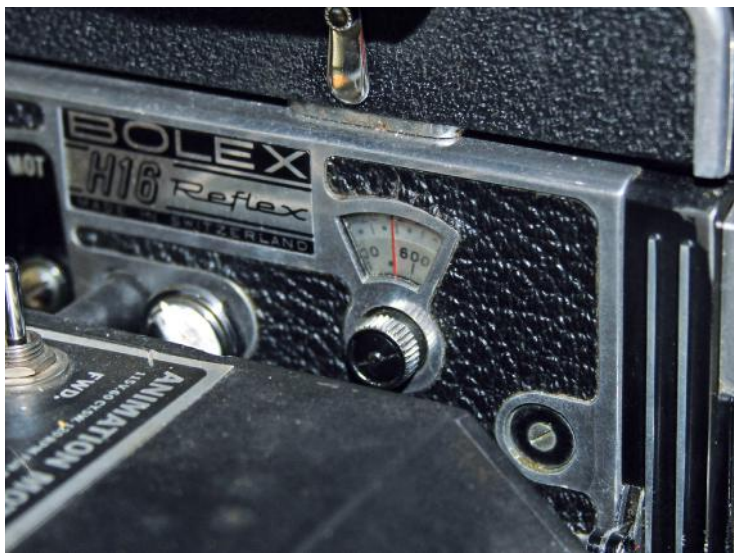


FIGURE 3.6
The frame counter on the side of the Bolex. Essential for making superimpositions, fades, dissolves, etc.

great you might begin to see imperfections in the lens (scratches, distortions, dust) rendered on your print. At this point you're probably wondering how in the world do I meter for this? The answer is you don't. Towards the end of this chapter I will give you starting times with voltages, f-stops and filters for all kinds of film stocks. You will use these as a starting point for your experiments.

Projector

The projector is either controlled by a motor built into the unit with a sequencer that can control it during programed functions (K-103) or a wired remote that can single frame it (and the camera) and then all of the programming goes through the sequencer (K-105 and higher). The nice thing about the K-103 projector is that it also has a frame counter built into it that can be zeroed out (Figure 3.7). This enables the user to zero out the projector at the beginning of each shot and then track their progress in the shot. In the K-105 and above you can only track the projected frames through the sequencer. This becomes a problem if for some reason the sequencer needs to be reset in the middle of a shot as the specific point in the projector and camera will be lost.

All projection units have the capability to take interchangeable gates for the following film gauges: Regular-8mm, Super-8mm, 16mm and 35mm (Figure 3.8). JKs were not standard-issued with the full assortment of gates so before you go to use one or buy one make sure it has the gates you need. Although he is extremely aged, at the time of this writing Jaakko Kurhi, the owner and operator of Meritex Inc. and the inventor of the JK optical printer, is still making replacement parts and repairing existing units. The website for his company is www.jkcamera.com.

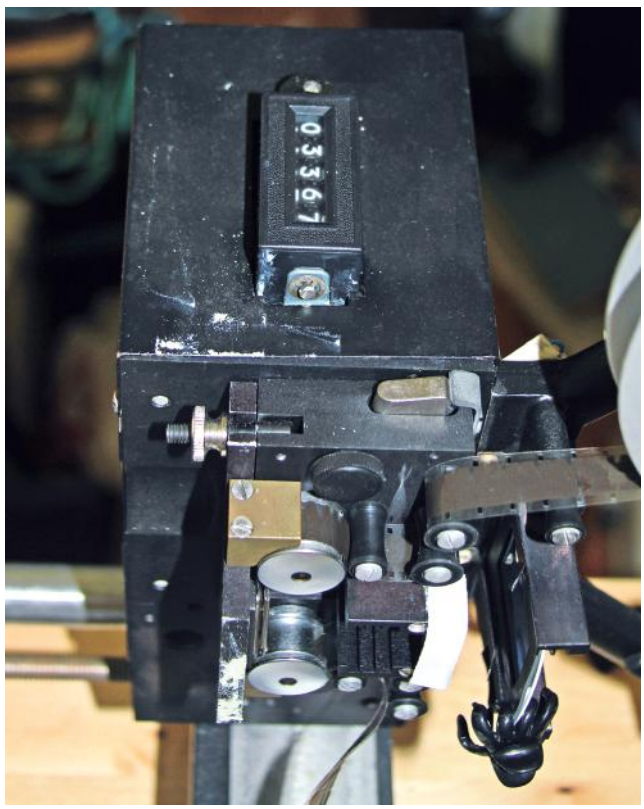


FIGURE 3.7
Projector total of my K-103.

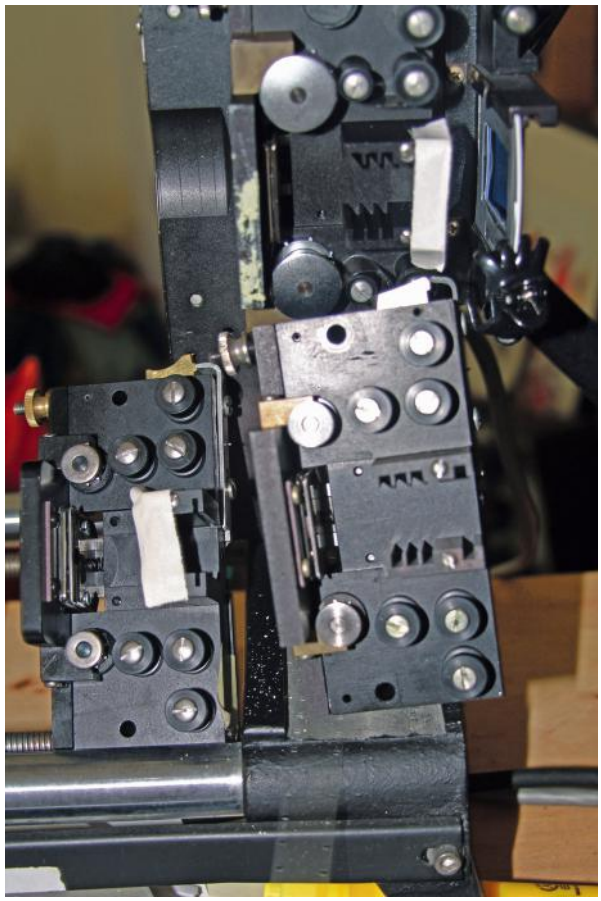


FIGURE 3.8
Gates for a JK optical printer. Counter-clockwise from lower left: Regular-8mm, Super-8mm and 16mm. Jaakko also made a 35mm gate, not pictured.

Lamp

(NB See Figures 3.1 or 3.2 to visualize.) Depending on how "new" or upgraded your system is, it may have an LED light source but most lamps are the old 300W versions with a dimmer. The lamps take basic projector bulbs that at the time of this writing could still be purchased fairly easily from good photo supply stores and online. The lamp is housed in a square metal casing with a vent on the top and has a fan inside that cools the bulb so it doesn't explode. The light from the bulb shines through a metal tube with an element on the end that can focus the light more intensely on the film plane. On the side of the unit there is a dimmer knob and a voltmeter. YOU SHOULD ALWAYS TURN THE KNOB ALL THE WAY TO THE LEFT BEFORE YOU TURN ON THE LAMP. If the person before you left the lamp on a high voltage, THE LAMP WILL BLOW WHEN YOU TURN IT ON and your work time will end before it even began. So turn the dimmer all the way to the left, then flip the switch to turn on the lamp. You will hear the whir of the fan inside and may see a dim light coming out of the lamp. Turn it up to about 70V to focus the diopter

and as far as 90V to focus the camera. You should not turn it up beyond that. It shortens the life of the bulb and can burn it out instantly. BE SURE TO TURN THE LAMP ALL THE WAY DOWN AND LET THE FAN COOL THE BULB FOR 5 MINUTES BEFORE YOU TURN THE LAMP OFF.

Sequencer

Although they all do basically the same thing, there are significant enough differences between sequencers that I will describe the different models separately.

K-103

The K-103 sequencer is solid state (Figure 3.1). If you open it (don't) you will see a bunch of capacitors and resistors and wires, and it will look like what you imagine was under the dashboard of the USS *Enterprise*. Old School. The settings are adjusted with sliders. The decisions you have to make are as follows:

- Total frame count for the shot on *either* the camera or projector. You input this with sliders for ones, tens, hundreds and thousands.
- Function—alternate count, step print, skip print.
- Camera frames—pick a number between 1 and 9.
- Projector frames—pick a number between 1 and 9.

Both the camera and the projector have motors attached to them that are controlled by the sequencer during a function. But you can advance both the camera and the projector individually should you wish to do so. If you are working with a K-103, you will not have to follow the programming instructions under BASIC FUNCTIONS although you should review the basic information contained therein.

K-105

The K-105 is a touch pad sequencer (on left in Figure 3.9 below). It is a basic interface. Figure 3.9 is a picture of the K-105 unit at Emerson College. This sequencer is *very delicate*. It will break if you push too strenuously on the pads. So be gentle. The sequencer controls everything. There are toggle switches to control the direction of the camera and projection motors on the side or back.

K-107/108

There are major advantages to the K-107 and K-108 sequencers. The push pad (Figure 3.10) is significantly more sturdy than the touch pad on the K-105 and it allows you to vary your exposure time (the duration that the shutter is open on the Bolex). This is really only advantageous if you are trying to shoot on very slow intermediate stocks such as 7363 or internegative stock. Although

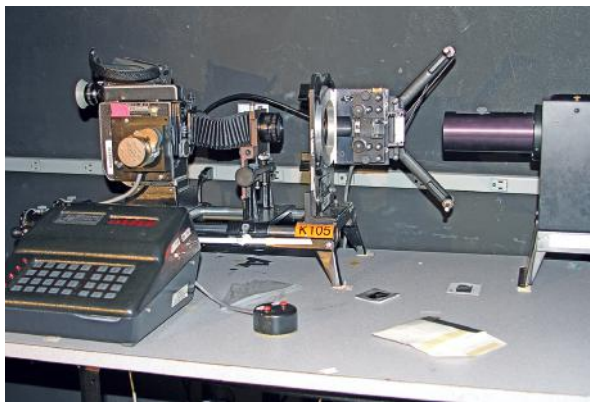


FIGURE 3.9
K-105 unit at Emerson College. Push pad sequencer on left.

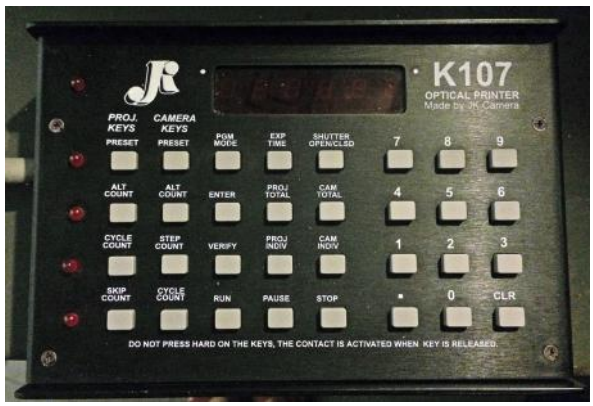


FIGURE 3.10
K-107 sequencer.

extending the exposure time makes a slow process even slower, it has benefits. The more you open up the lens, the more shallow the depth of focus. If a lens is all the way open, you may not be focused throughout the depth of your original! Thus some or all of your frame will be out of focus. So extending the exposure time will allow you to stop down the lens and get back to the sweet spot, around f11.

Rails

Rails are what the camera, lens mount and film gate are attached to. In the K-103–K-105s the rails sit on legs. For the K-107 and K-108 the rails are mounted on a platform that has the sequencer attached to it (refer to Figures 3.1 and 3.2 respectively). There are two knobs at the user end of the rails. One operates the camera, moving it closer to you or closer to the gate, whereas the other moves the lens mount closer to the camera or to the gate. These knobs enable you to focus and resize the image. Figure 3.5 shows the back of the K-107 with the knobs at the top of the frame as well as the location for the power and camera, and projector direction switches for the unit.

Magazine

Some units will have a magazine that you can attach so that you can print with larger quantities (up to 400ft) of 16mm film (see Figure 3.1 to visualize as a part of the whole set-up). This is very helpful if you are attempting to do long superimpositions or shots with multiple overlapping techniques. I have also used my magazine to bi-pack my system, loading the magazine with raw stock and putting the mattes on daylight spools within the camera. Obviously, if you are going to bi-pack the camera you will need to place the matte closer to the gate than the raw stock. Figure 3.11 is a picture of the magazine on my

FIGURE 3.11
The magazine on my K-103 JK.

K-103. It has its own motor so as not to stress the Bolex and to keep tension on the take-up.

PREPARING FOR YOUR SHOOT

Most folks don't have an optical printer in their own home. They have to go to their school or their friend's house, or an art center like Millennium Film Workshop in New York City, to use one. So, just like when you go on a shoot, it is really important to be prepared with all the things you might need. Below is a checklist of items you should bring with you to your optical printing session. Following that is the items you should make sure that you can check out while you use the optical printer to facilitate your shoot.

To bring with you

- A small flashlight and/or headlamp (seriously).
- Canned air and/or one of those little brushes with a mini-whoopee cushion attached.
- At least three daylight spools and cans. You might not shoot all your film so you will need to break your roll and put the exposed in one can and the unexposed in another. Be sure to label!
- Unexposed film.
- The film that you are going to rephotograph.
- Black camera tape and a little black wrap if you have it.
- Scissors.
- An orange stick.
- Lens-cleaning fluid/papers.

- Isopropyl alcohol (99% pure) and cotton swabs.
- A magnifying glass.
- A fine-tipped Sharpie.
- A notebook to record your shots, exposures, settings, filters, etc.
- Something in the gauge you are shooting in that is easy to focus on. Titles or academy leader works great.
- White quarter-inch paper tape.
- Film renew or other film cleaner and cloth.
- A calculator.

Make sure the school/friend/art center has the following to use

- 400ft split or take-up reels in 16mm or 35mm (whatever format you are rephotographing) for take-up.
- 100ft or 400ft Super-8mm reels if you are shooting Regular or Super-8 for take-up—make sure they also have the adapters for the take-up spindles! Otherwise these just spin.
- A viewer and rewinds appropriate for the film you are rephotographing so you can find your frame and not waste your time going forwards and backwards on the projector end of the JK.
- The correct gate for the formats you are shooting. Meritex Inc., the manufacturer of the JK optical printer, machines several gates for the different film stocks commonly used in its projector. They are: Regular-8mm, Super-8mm, 16mm and 35mm. BUT not all people/institutions who have JK optical printers have all of these gates so make sure you will have the gate you need before you show up.
- A splicer and tape in the appropriate gauge for the film you are shooting.
- A prism for focusing.

IN FRONT OF THE MACHINE

Basic checks

So you're standing in the JK room. Usually they are shoved in rooms barely bigger than a closet that are completely black inside and have little or no ambient or overhead lights. Try not to get claustrophobic. This is a safe and nurturing space. Breathe. If you need to, prop the door open when you aren't shooting. This will let much needed air and light in. But when you are shooting, keep it closed.

You want to get started right away, but there are a few things you should check first to make your shoot go smoothly. First, is there film in the camera? To be kind you may want to turn off all the lights in case it is someone's great work

of art, so get it as dark as possible and then pop open the door of the Bolex. Put your (clean!) hands inside and feel around. Is there film in there? Are there reels on either the take-up or feed side? If yes, pop them off and feel inside. If there is film, you'll feel it. Have a can nearby so you can put it in. Switch on the lights, prop open the door and go hand your discovery to the labbie or friend. They will be grateful.

Cleaning the camera and projector

Before you put your own film in, using your flashlight for added light, and your little brush and canned air, clean the inside of the camera. Make sure not to blow air into the gate, but be sure to take the pressure plate off and clean the gate thoroughly. The gate on the JK Bolex is exactly the same as the gate on any other Bolex. In order to really do this right you need to take the bellows off so you can get at the lens from outside. There is a small silver knob that tightens them to the adapter (the black ring connected where a lens normally goes). Turn that until it is loose, and you can pull off the bellows but not so far that it comes out. Gently push the bellows out of the way. Using the end of your orange stick, move the prism out (it swings out like a little door) and DO NOT TOUCH IT WITH YOUR FINGERS. Even clean hands have skin grease on them and that is not good for prisms. To move the shutter out of the way, however, you need to press the "open shutter" button on the sequencer. Then shine your light into the gate from that side. Contorting yourself like a true yogi, get your head around so you can see the gate from the interior of the camera side. Now using your magnifying glass look at the gate. Are there little hairs in it? If yes, gently rub your orange stick along the offending edge. You may put a very small amount of lens cleaner or isopropyl alcohol on your orange stick to make dust and dirt adhere to it better. Once the gate is clean, close up everything and pat yourself on the back.

If you are not familiar with how a Bolex works PLEASE DON'T DO THIS UNTIL SOMEONE TRAINS YOU. You will be glad you did.

Then check the front element of the lens and, if it is grubby (they usually are, or are at least dusty), use a small amount of lens cleaner and a clean lens tissue to gently wipe it clean. You may want to use your flashlight to check and make sure that it is really sparkling. Dust or fingerprints on the lens translate into out-of-focus images. Before you reattach the bellows to the Bolex it is an excellent time to focus the diopter to your eye.

Focusing the diopter on the Bolex

This is just like focusing the diopter on an ordinary Bolex and is necessary to do fine focuses and framings by eye as you shoot. Make sure the bellows are not attached to the Bolex. You can either hold your flashlight in front of the prism or if this contortion is annoying to you (it is to me) just flip on the lamp and turn it up to 70V or so. It doesn't have to be very high, just bright enough to see the ground glass in the Bolex clearly. Put your eye to the eyecup

and turn that diopter until the ground glass is in sharp focus. If you haven't done this before it is sort of like looking for the texture in paper. It looks white, it looks white and then all of a sudden you can see the texture. You have just calibrated the Bolex on the JK to your vision. So what you see through the viewfinder as out of focus is out of focus in the film plane and vice versa. Nevertheless, framing through the viewfinder is not always 100 percent accurate so please be sure to follow framing and focus instructions below.

Changing the gate

Now move over to the projection side. Check what gate is in the projector. Is it the one you need? If you forgot to make sure that the rubber stoppers are present on the spindles, do so now. If they aren't, check around nearby. Hopefully the last person just left them on the table. Note to self—if you have trouble finding the rubber stoppers because the last person using the JK didn't put them back on the spindles, be courteous and do so for the next person. Always leave the JK better than you found it. It's a camera karma thing. If the gate that you want isn't on the JK, take whatever is on off, put it gently where it belongs (usually a box or a bag or on a shelf where the next person can find it) and get the gate you want. Before you put it on, take your alcohol and cotton swabs (you may want to open the door for this as it can get fumey) and clean the transport mechanisms on the gate thoroughly. That would be the silver metal spindles and the black plastic ones. Also clean around the gate. Once it is all sparkling clean, look on the back side and move the silver transport spindles so that they match the connections on the projection block. If you have never done this before, get someone to show you how the first time. It is tricky and the gate will not go on if the spindles are not oriented exactly like the inputs. There are two screws on the gate too. Make sure they are in place before you mount the gate on the projector and then screw them in until they are finger-tight. Do not muscle them as they are delicate. However, these screws can shimmy loose after hours of printing so it is a good idea to periodically check their tightness.

Setting the frame and focusing the JK

Now that you've got your gate on and clean, take out the piece of film you want to focus on. It's not a terrible idea to have already cleaned the film (assuming it can be cleaned and isn't hand-painted or fragile or something) before you print as dust WILL SHOW UP in the printing. Put the film you are going to focus and frame with into the projector. Please see Figure 3.14 for the correct way to load the projector. Make sure it is flat in the gate. You might want to move it one forward or one backward as sometimes the gate has come to rest slightly out.

If you had closed up the Bolex after you cleaned it (as you should have), open it up. Get out the prism for focusing and take the pressure plate off the Bolex. The prism goes on where the screw attaches the pressure plate (see Figure 3.12)

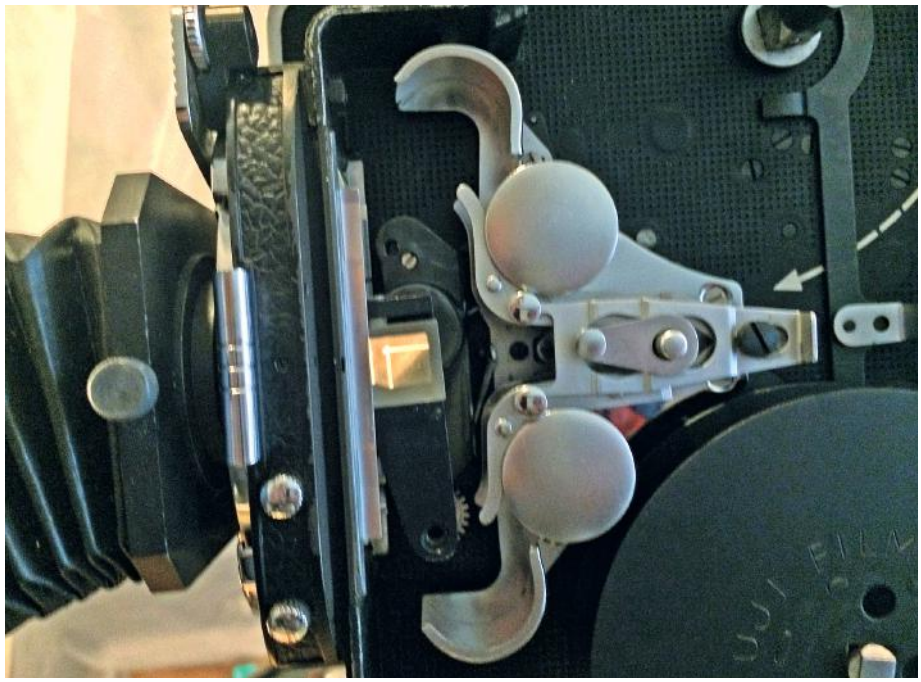


FIGURE 3.12
Remove the gate from the Bolex and put the prism on to focus the printer.

and should rest in the gate. Open the shutter by pressing the open-shutter button on the sequencer. Turn on the lamp to 90V and open up the lens all the way. Make sure there are no filters or diffusion behind the gate in the filter holder area. Get out your magnifying glass and look at the prism. It is showing exactly what is in the gate. This is an excellent time to get out your black wrap if you brought it and make a flag on the front left-hand side of the projector to block the screaming bright light of the lamp. No joke—it could burn out your retina.

On the back of the JK (behind the Bolex and down near the table) there are two round dials with silver or black knobs on them. One is for framing (moves the front element of the lens in and out) and the other is for focus (moves the camera closer and farther from the lens element). If there are locking screws beneath the transom that the Bolex is mounted on, find these and make sure they are unlocked before you frame and focus.

Right now you are trying to determine what full frame is and then fine-focus for that full frame. Later you can experiment with zooming in or out from that frame but for now we are going to work with the full frame. So move the framing knob until it seems as though the film frame fills the camera frame. If the person before you was using a different gate or was shooting in anything

other than full frame, this could be a laborious process where you move the lens element and then the Bolex until you get it somewhere near the right spot. If the frame seems really off left to right or up and down there are also adjustments that can be made on the front element of the lens to orient it properly toward the gate. There are locking screws on these as well so please check carefully before you start moving things. If anything is difficult to move, the locking screw is probably on. The dial for N/S movement (that is up and down) is underneath the lens element. The dial for E/W (side to side) is below and to the right as you face the lens. Move these until your frame is centered in the gate as you look at the prism. The prism is tiny so here again your magnifying glass will be useful. Once you have the frame correct you should see NO framelines on top or bottom or left or right, but if you nudge the frame a little in either direction they will come in. Now tighten all the locking knobs on the lens element. You may see your frame go a little out of focus. This is because when you had the N/S knob loose the lens element was tipped ever so slightly and this can impact focus. Now that your lens is battened down, nudge that focus dial back and forth until you get the best focus you can. Thankfully you probably won't be shooting wide open so your depth of focus will be a micro-hair thicker than what you are seeing.

Once your focus is completely set, take a piece of quarter-inch paper tape and lay it down on the rail on the right-hand side of the Bolex track. There is sometimes a ruler-like thing there and there should be a little metal pointer coming off the transom that holds the Bolex and another that holds the lens. With vertical marks indicate where each marker is on your strip of tape. You should also label (write small but legibly) that the Bolex one is FFB (full-frame Bolex) and the lens one is FFL (full-frame lens). If you are going to be moving back and forth between different gauges (say superimposing Super-8 and 16mm) during the shoot you should do this for both BEFORE YOU LOAD THE CAMERA WITH FILM. Thus your markings would read FFB-16, FFB-8, FFL-16, FFL-8. If you have varying sizes of frames that you are shooting with you can make all these marks before you begin to shoot as well. It isn't a terrible idea to have two Sharpies of differing colors (red and black is always nice) that you use for the different gauges.

LOADING THE CAMERA WITH FILM

Once you are completely done with all your fine focusing and mark making take the prism out and put it where it belongs, put the pressure plate back in and make sure it is flush against the gate, close the loop formers inside the Bolex, turn out all the lights (including the JK lamp) and put your unexposed film on the top spindle inside the Bolex the same way you would in an ordinary Bolex (film should come off the left side of the daylight spool). Feeling around, bring your film to the clipper on the bottom of the Bolex body. Clipping your film will really help it load more smoothly. Make sure the trimmed part is brushed out of the camera. Then gently insert the film against the upper

sprocketed drive. There is no winding arm or spring on this Bolex so you have to use the motor. Do not, under any circumstances, try to remove the motor. If your Bolex has a single-frame advance, find it and use it to advance the camera as you load it. If it does not have a single-frame advance (this would be odd), you can input a sequence into the sequencer so that the Bolex runs constantly for a set number of frames. You may prefer to do this rather than single-frame advance. If you do, see below under "Sequence for Loading the Camera" in the "Basic Functions" section. It is best if you input this sequence before you are in the dark, but, if you forget, close the camera door (with your film inside so it is protected), turn on the lights or your flashlight and input the sequence. Then go back to the dark, open up the camera, make sure the loop formers are closed as closing the camera will have opened them, put the film against the sprocketed drive and press the last PROGRAM RUN when you are ready for your film to advance. As the film begins to move and you no longer need to hold it, bring your hand down to the bottom and wait to feel the film as it comes off the lower sprocketed drive.

When there is about 8" of film you should stop the sequence, wind the film onto the daylight spool take-up reel you have standing by, put that on the lower spindle and gently close the Bolex door. Never force the door as there are tiny pieces of metal that serve to lock it that are easily bent. Once the door is closed you may turn on your flashlight or the room light. If there was any light on during the loading of your film you will want to advance the film for a few frames so that it will not be fogged. You can do this by using the same simple sequence I listed for loading. Remember, 40 frames is a foot and set the amount of camera frames accordingly.

Now you are ready to shoot. If you loaded the camera with a fresh 100ft roll of film you only have 4000 frames to go!

LOADING THE PROJECTOR

When the projector is moving forward the top spindle on the projection unit is take-up, whereas the bottom is feed. When the projector is moving backwards the top spindle is feed and the bottom spindle is take-up. If you look on the opposite side of the projection unit you will see springy bands that are coming out of the housing of the projector (Figure 3.13). These are what move the spindles and keep the film taking up. It is imperative that they are properly connected or your film will not take up correctly and will pool in front of the lens, ruin your shot and possibly melt. But there is a trick. In the "normal position" where the springy band is going directly around the spindle and back, your film will wind up over the top. This is the opposite of the wind with which film and workprint comes back from the lab and with which film is wound for projection. So you can either wind up your film the opposite way that it wants to go or you can put a single twist in the springy band and it will take up your film from the bottom of the reel (the way the film already wants to wind). This does not hurt the machine or the band. The same rule applies

to taking up film on the bottom spindle. You should only apply the take-up springy band to the spindle that is taking up. If there is another springy band it is simply to hold tension on the feed side.

So moving back to the gate side of the projection unit (Figure 3.14), unscrew the knob facing the lens above the gate until you can swing the knob up and move the front element of the gate out slightly. Using your rewinds and viewer you should already have located the frame you want to begin shooting with. Place this frame in the gate. Gently slide the front element (essentially a pressure plate) back onto the gate. Swing the top knob back down and thumb-tighten. Wind the film snug on the take-up (you may have to back the film off the square part of the spindle to move it freely) until tight. Then put it securely on the square part of the spindle and put the rubber plug onto the spindle so that it holds the take-up securely in place. If you have 400ft split or take-up reels these work the best as they have a larger core. The spindle revolves to accommodate this core. If you use a daylight spool as your take-up you will need to wind the film up on it every so often so that it doesn't hang down in front of the lamp, ruin your shot and melt. It is OK to have your feed on a

FIGURE 3.13
These are the spring belts that help to keep tension on your film. I twist them once so that they take up with the wind of the film.

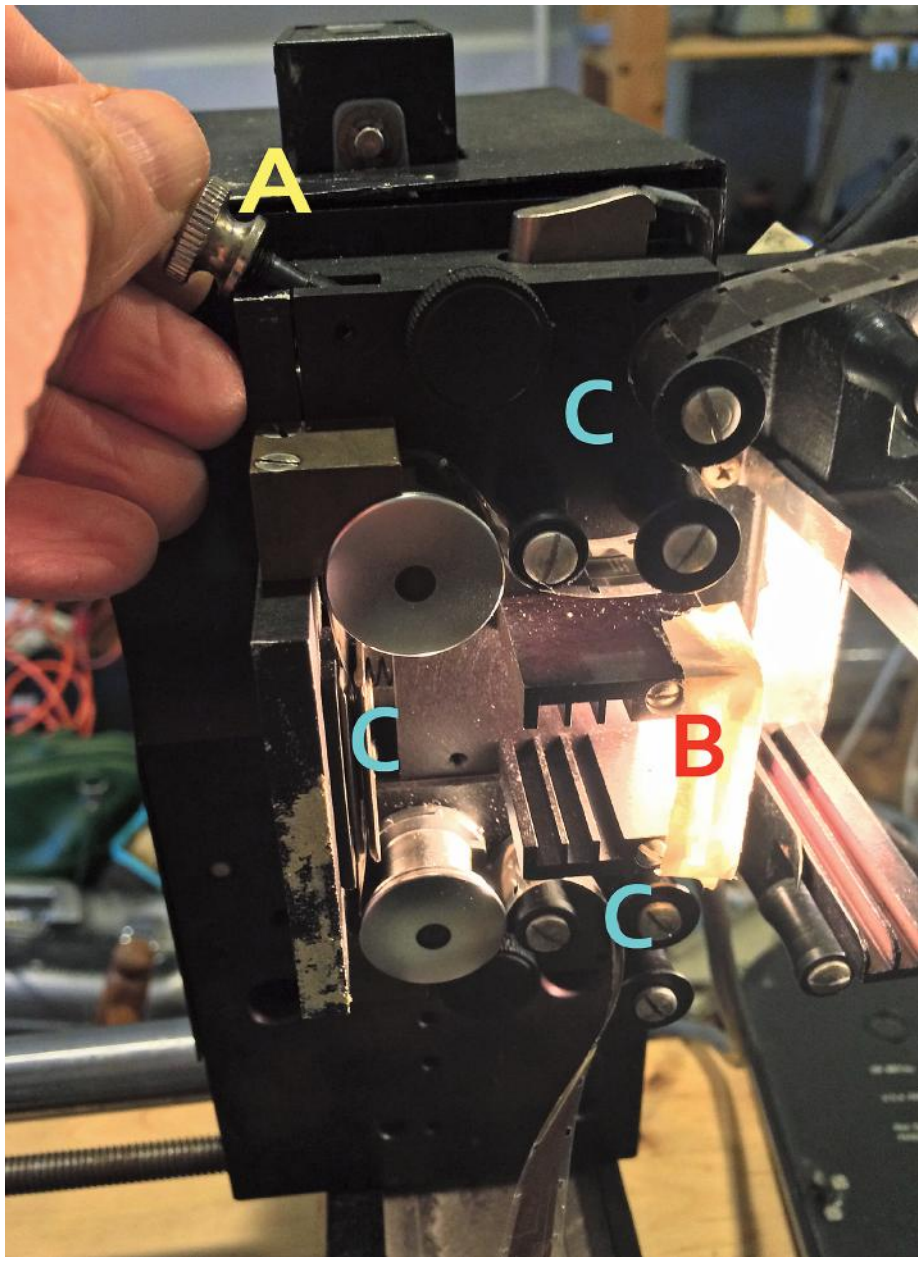


FIGURE 3.14
A 16mm gate. A is the knob that unlocks the pressure plate and locks it back in. If it isn't engaged B is the ground glass. This must be in to diffuse the light so that you do not get hot spots on your film. Behind the small slots for the ground glass are larger slots to put filters in. C is the path of the film. When the film is loaded up going forward, the bottom reel is feed and the top reel is take-up. In this image the feed is coming from loose film at the bottom and is winding onto the top reel. This is because I often shoot off lengths that are in a trim bin by my work table.

daylight spool (as long as you are coming from the bottom) as it has nowhere to fall but the table.

If you are shooting very short lengths of film you may want to have some sort of trim bin in the JK room as well so you can hang them up before use. If space is tight you can bring in your clips in labeled sandwich bags and then just reel them up as you go. Below you will find descriptions of basic functions on the optical printer. Please review them and the checklist before you begin printing.

BASIC FUNCTIONS

Sequence for loading the camera

In order to thread the Bolex and have about 8″ of film coming out the take-up side to wind around the reel, you need to advance about 50–60 frames. Let's assume that you spend the first bit of this fumbling trying to get the film to thread on the top sprocket of the Bolex and round up the number of frames needed for the sequence to load to 100. There are three different models of sequencers for the JK as listed in the component section above. Make sure you understand which one you are working with before you begin, although they basically all have the same functions. You will always need to know the total length in frames of either the projected image you are trying to reproduce or the number of frames in the camera you are trying to take. To load the film in the camera with a K105–K107 input the following sequence.

- PROGRAM
- STEP (OR Alternate)
- ENTER
- CAMERA PRESET COUNT
- 100
- ENTER
- PROJECTOR PRESET COUNT
- 1
- ENTER
- PROGRAM
- RUN

When you press run, the machine will begin to execute the sequence. You should see the frame counter moving on the Bolex and on the sequencer. Notice how you must press program to begin the sequence and enter after you input both the function and the number for that function. You press program to end the input.

Changing film format/film speed

So say you shot a scene at 48FPS and you now want it to run at normal speed. Or you shot it at normal speed but now you want to speed it up. This is a very simple process on the JK. First determine either how long the source footage is or how long you want the resulting shot to be in frames. Then determine the ratio—how many frames the camera will need to take of the projected image. In the first scenario you are trying to change a 48FPS shot into a 24FPS shot. If the original shot is 10 seconds in length (240 frames) the sped-up shot will be 5 seconds (120 frames). The sequence for that would be as follows:

- PROGRAM
- PRESENT COUNT CAMERA
- 120
- ENTER
- ALTERNATE COUNT CAMERA
- 1
- ENTER
- ALTERNATE COUNT PROJECTOR
- 2
- ENTER
- PROGRAM
- RUN

That was an easy one to figure out. Sometimes they are more difficult. Say the original shooting speed doesn't easily divide or multiply to make the desired frame rate. A good example of this is when you are trying to change something from silent speed (18FPS) to sound speed (24FPS). First determine the total length of the projected image in frames. Then figure out the ratio. The projector is 18 and the camera wants 24. For second you need 6 more frames. How will you accomplish that? Six goes into eighteen three times so if you shoot every third frame twice you will end up with 24FPS. This is called step printing and you input the function like this.

- PROGRAM
- TOTAL PROJECTOR COUNT
- 120 (WHATEVER THE ACTUAL LENGTH THE SHOT YOU WANT IS)
- ENTER
- CAMERA STEP COUNT
- 2
- ENTER
- PROJECTOR STEP COUNT

- 3
- ENTER
- PROGRAM
- RUN

Different sequencers have slightly different ways to input information and sometimes you can get the same result using a different function. STEP PRINTING refers to slowing down footage, taking multiple exposures of a single frame of projected image. SKIP PRINTING speeds up the image by skipping some of the projected frames. ALTERNATE COUNT is another way of putting in these ratios.

THE CHECKLIST

When you are optical printing there are a lot of things that you need to remember all at once, for every shot. Although these translate across most optical printers, I will be giving the instructions based on the JK optical printer. If you are working with a home-made optical printer or another model such as an Oxberry, you will want to adapt this checklist to suit that machine. I strenuously recommend that you copy it down and bring it with you to review before every shot, every time you print.

- Focus and frame—have you adjusted your framing and focus? Did you loosen anything when doing so? If so, tighten it down. Jiggling can cause focus problems.
- Close the eyepiece—did you set your focus through the eyepiece? If so, close the eyepiece unless you plan to have your eye glued to it the entire time the printing is going on. Otherwise light will fog the film plane.
- Variable shutter—make sure the variable shutter is open if it is supposed to be open, or closed if it is supposed to be closed. Whenever you are doing superimpositions or lap dissolves or anything that causes you to move already exposed film backwards in the camera YOU NEED TO CLOSE THE VARIABLE SHUTTER. And then before you shoot again, whatever you want to superimpose, YOU NEED TO OPEN THE VARIABLE SHUTTER. So check it. All the way up is open. All the way down is closed. Also, if you see the little black triangle when you look through the eyepiece the variable shutter is closed or partially closed.
- Camera/magazine direction—is your camera motor and magazine motor set to go in the direction you want it to?
- Projector direction—is your projector set the direction you want it to go?
- F-stop—is the f-stop on the camera set correctly? If you focused or adjusted framing DOUBLE-CHECK because you often open all the way up to do these things.

- Filters—do you have filters in the filter holder? Are they what you want? Have you compensated for them when you set your exposure?
- Rubber stoppers—did you take them off of the projector to adjust the film? Put them back on. If you don't the take-up reel will shimmy its way off of the take-up and stop taking up and film will fold down between the lamp and the gate, and perhaps catch on fire or melt. In any event your shot will be ruined.

Just to make sure I don't forget—I have this Post-it on my unit (Figure 3.15).

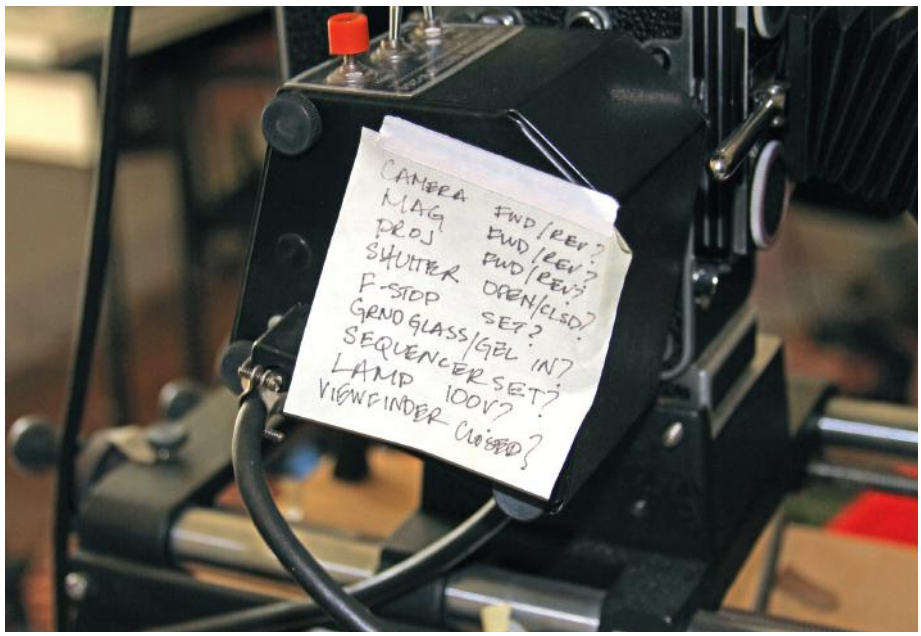


FIGURE 3.15
A post-it on my JK that reminds me to double-check everything.

MORE COMPLICATED OPTICAL EFFECTS

Superimposition

Superimpositions refer to printing a sequence of images over another sequence of images. In fact, you can superimpose several images over the same piece of film. The most layers I have ever superimposed is four. Beyond that you really lose the discreteness of the individual image. It is important to distinguish between matting and title work, described below, and superimpositions. With the latter, you need to make adjustments in exposures because you are laying light upon light upon light and there is only so much the film can take before being totally overexposed. So the basic equation is this: if your "correct" exposure

is f11, and if you are superimposing two images, you need to shoot each at an f11/f16 split. If you are shooting three images shoot a third under f16 each, 4 images f16. Of course, if you are trying to superimpose very light images with darker ones you might need to compensate differently, using "less" light (a larger f-stop/smaller aperture for the lighter images) or "more" light (a smaller f-stop/larger aperture for the darker images). The best thing to do is to shoot tests when you are doing tricky camera work and keep very careful notes as to what you shot, so that you can see which combination of exposures worked best.

The process is fairly straightforward but warrants a checklist because it is so easy to mess up. Zero out the frame counter on the side of the Bolex (see Figure 3.6) by advancing to zero using your camera single-frame advance and then turning the knob on the frame counter until the tens are at zero too. This is an important step so don't skip it. THEN:

1. Run through THE CHECKLIST above.
2. Shoot your sequence.
3. Close the variable shutter.
4. Backwind until the frame counter is at zero frames (where you started).
5. Frame up your next shot.
6. Open the variable shutter (run through THE CHECKLIST just to be safe).
7. Shoot the next sequence.
8. And so on.

Dissolves

It is possible to create dissolves between two shots, although they are not as smooth as lab dissolves. You print a sequence until you get to the point at which you want the dissolve to begin. You record the number on the frame counter. You input your sequence (usually the best you can hope for is a 24-frame lap dissolve) and once it starts you slowly close down the variable shutter until it is all the way closed at the end of the sequence. Keeping the variable shutter closed, backwind the camera 24 frames. Get your next shot loaded into the projector. You will use the same sequence you did last time and it is already loaded into the projector, so all you need to do is press run and slowly open up the variable shutter until it is totally open after 24 frames. Alternately, you can advance 2 frames, close down a hair, advance 2 more frames, close down a hair and so on.

Change frame size (zooms)

You can zoom into an image or reframe an image easily. However, when you zoom in you enlarge the apparent pixel size in the image you are rephotographing. If this doesn't bother you (why should it?) then it is possible

to get some really interesting effects by zooming in and moving around in images. If you want some kind of smooth zoom or pan you will need to determine the beginning frame and the ending frame, and how long the move is. You should mark these on your paper tape on the rail so they will be easy to find. Then separate the distance between the beginning frame and the ending frame by the number of frames of the move. That means you move a little each frame (refocusing each time) and then shoot a frame. This can also be done on twos (shoot 2 frames every move) but if you use any larger integer (3 or more frames shot per frame projected) the moves start to look jerky. Remember when you extend the bellows the image requires more light so, again, you will want to test your exposures. It should be sufficient to test an exposure at the beginning , middle and end of the move, and then estimate from there. In my work I have also done some zooming and reframing on the fly, which meant I was moving the camera and the front element as the camera was shooting! This resulted in some of the frames being a little blurry but this was an effect I liked.

Burning in titles

Burning in titles means putting white or optically clear titles over an image. This is a technique I have used extensively in my work for subtitles, intertextual

FIGURE 3.16
Burnt-in title and image ("spread democracy") from *Yanqui WALKER and the OPTICAL REVOLUTION* (2009) by Kathryn Ramey. The image to be burned in was printed as black text on white paper, then filmed with Hi-con film and developed as negative. It was burned in over the moving image by first filming the image of the piggy banks, backwinding and then filming the text image over that so that, where the image in the title film was clear, light burned out the image in the background.

comments, and title and credit sequences. First I shoot the titles I want on High-contrast stock (Kodak 7363). I shoot black titles on a white field and then develop the Hi-con as a negative so I end up with clear titles on a black field. Then I photograph the sequence I want to put them over, making a note of at what point (how many frames in) I want to begin the titles. I also make a note of where the whole sequence stops on the frame counter so that I can get back to that frame when I am done. Much like the superimposition, I close the variable shutter, backwind the camera until I get to the frame I want to start at and then put in the title I want to burn in. UNLIKE the superimposition I do not have to compensate for exposure because I want the titles to be clear. I want them to totally blast out from the image underneath where they are. The black of the Hi-con must be dense enough to allow me to do that and not bleed light through onto the image I want to keep. Like with the superimpositions, it is a good idea to test exposures on this because, in order to get optically clear titles, you may need to open up as much of a stop from the shooting stop you were using on the background footage. Once you shoot the titles for the desired length of time, close the variable shutter and advance to the end of the background shot. Then get yourself ready for your next shot.

Traveling mattes

Traveling mattes are a way to get an image onto another image without it being a superimposition. In other words, without being able to see the background image through the foreground image. Say you want to take a picture of a pig, flying in a blue sky. Shoot a picture of a well-lit pig against a fairly dark background. Perhaps you want to put some wings on it, perhaps not. Then shoot a picture of the sky. Choose a day when the sky looks good with blue and clouds, and be sure to underexpose the picture slightly so you can get a really blue sky.

Rephotograph the pig film with High-contrast stock and have a print made, also on High-contrast stock. You will end up with a negative image where there is a black pig on a white background, and a positive image where there is a pig on a black background.

There are two ways to shoot this pig. If you have a film magazine, you can bi-pack the matte in the camera with your unexposed film. If you don't have a magazine, you can bi-pack (sandwich together) the matte with the film. You will put the negative image (black pig, clear background) in front of the background image in the projection gate. You will shoot this sequence. Close the variable shutter. Backwind the camera. Put the pig and the positive matte (white pig, black background) sandwiched together in the gate. Be sure to line this up frame accurately so that the matte and the pig are perfectly matched. Open the variable shutter. Shoot this sequence. That's it. Apart from testing it several times for correct exposure, you should end up with a picture of a pig in the sky. This is how all special effects (think *Jason and the Argonauts* by Ray Harryhausen) were done before fancy digital effects. Neat, huh? Figure 3.17 is

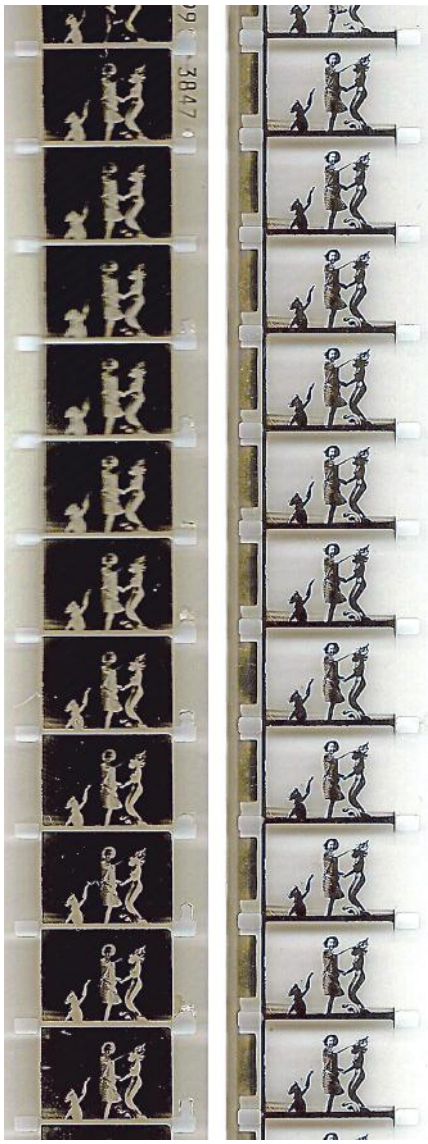


FIGURE 3.17
Clips of positive and negative traveling matte.

FIGURE 3.18
Composite with those mattes.

FIGURE 3.19
Still from Bill Brand's film *Chuck's Will's Window* (1982)—example of a traveling matte.

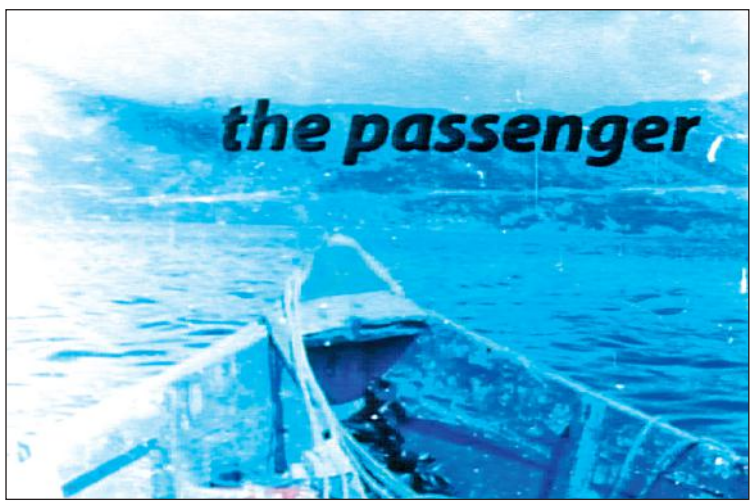


FIGURE 3.20
(*Right*) The title sequence of *the passenger* was a traveling matte of the text moving left to right across a scene of the prow of a boat with a different texture of water within the letters.

a positive and negative traveling matte and Figure 3.18 is the composite, from my own experiments. Figure 3.19 is a still from *Chuck's Will's Window* (1982) by Bill Brand. Figure 3.20 is a frame from the title sequence of my film *the passenger* (2006).

FILM STOCKS/EXPOSURE/FILTERS

Film stocks are changing all the time. The ideal film stock for use with the optical printer is a very slow, fine-grained, tungsten-balanced stock. Unfortunately, Kodak's slowest tungsten-balanced stock is 200ASA. It is relatively fine grained, so it isn't terrible to shoot with, but you will need to use a lot of filters to modify the light. If you just dim the light, its color temperature will change, becoming more orange, so you want to keep between 80–95V. I have also had good luck with shooting on 50ASA daylight-balanced stock and using an 80A filter or full blue CTB. I cut my gels and put them in slide holders so that I can easily load them behind the ground glass. I also label my filters so that it is easy for me to find the one I am looking for (Figure 3.21). I also have several neutral-density filters so that I can cut the light coming from the lamp without changing its color temperature. As I have said before, I prefer to shoot at an f11 or f16.

One of the ways that I determine exposure is by shooting test strips in Tri-X and then hand-developing them. This can get me within the range of proper exposures for each film/stock combination. But nothing can substitute entirely for tests with my shooting stock. Therefore, I always run bracket tests for each project. Figure 3.23 is a page from my book of film strip tests.

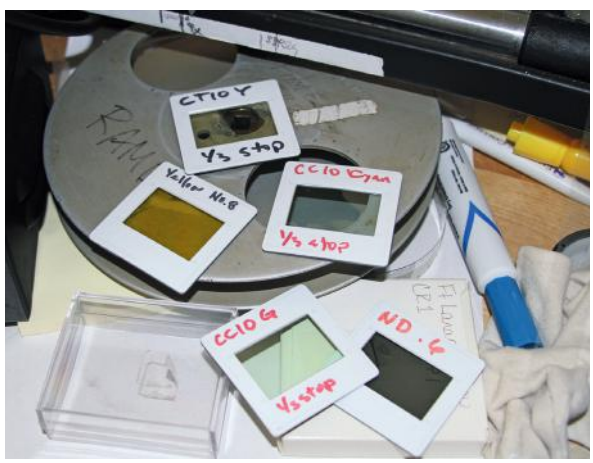


FIGURE 3.21
My labeled filters in slide holders ready to go.

FIGURE 3.22
A gift of filters from Craig Baldwin!

FIGURE 3.23
With every project I shoot exposure tests, particularly when I am executing complicated superimpositions. This shows one page from my exposure tests on Plus-X (no longer manufactured Kodak black and white reversal stock, testing for 50ASA color negative). Notice how I bracket from f45 to f2.8 and change the voltage on the lamp.

CONCLUSIONS—OPTICAL PRINTING (FOR NOW)

I own a K-103 optical printer that I purchased from a poet over eleven years ago with funds from Pennsylvania Council on the arts grant. This sale was brokered by Bill Brand who I met at the Flaherty Film Seminar in 1999, but my love affair with this quirky machine began when I was an undergraduate student at the Evergreen State College in Olympia, Washington, in the late 1980s. I loved the way the machine sounded, what it could do and how using it made me feel like I was playing a visual musical instrument. I have made almost all of my films since on an optical printer and it has become a critical part of my image-making practice, much like a typewriter or particular type of pen might be part of a writer's working method. There are two people who greatly influenced my work with this machine: Peter Rose (interviewed in Chapter 9) and the man who found me my JK, Bill Brand. He and I sat and talked for hours in preparation for this chapter, but this interview was conducted via email. If you don't know Bill, he is an artist, a film archivist, a parent and a professor at Hampshire College. He still lives in a loft in New York City even while the city is being gentrified around him. Visiting him in his studio in the city, drinking some delicious coffee and chatting, it is possible to imagine

FIGURE 3.24
Bill Brand with his printer *circa* 2004-ish.

Manhattan before the Trumps and the Hiltons and all of the insane skyrocketing real estate. For that I am grateful too. Romantic notion though it may be, it is nice to remember that once upon a time there were more artists than bankers and real estate developers roaming the streets of TriBeCa and SoHo and the Lower East Side.

BIOGRAPHY OF BILL BRAND

Bill Brand's films, videos and art installations have been exhibited extensively in the United States and abroad in museums, at film festivals and in microcinemas. His 1980 *Masstransiscope*, an animated mural installed in the New York City subway, is in the MTA Arts for Transit permanent collection. Bill Brand lives in New York City and is Professor of Film and Photography at Hampshire College in Amherst, Massachusetts, as well as Adjunct Professor of Film Preservation at New York University's Moving Image Archiving and Preservation graduate program. His company BB Optics specializes in archival film preservation of small-gauge films and films by artists. In 2006 he was named an Anthology Film Archives Film Preservation Honoree and given a month-long retrospective to celebrate BB Optics' 30th anniversary.

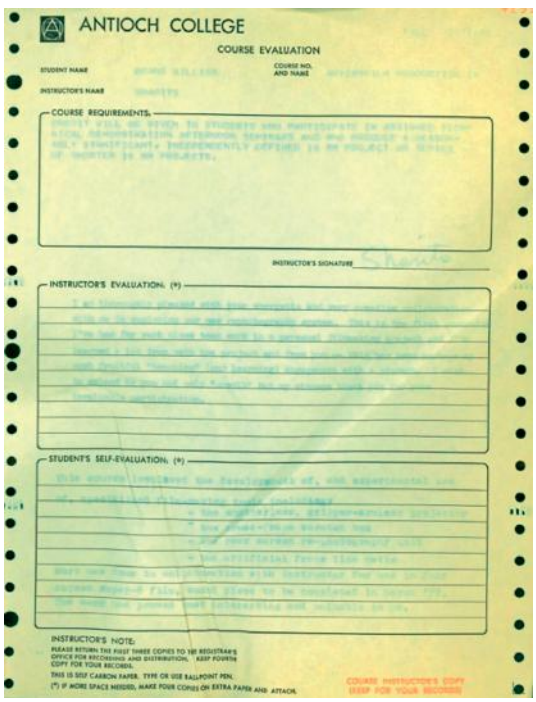
Brand's films and videos have been featured at museums including the Museum of Modern Art, Whitney Museum, National Gallery of Art and Shanghai Duolun Museum of Modern Art, as well as at major film festivals including the Berlin Film Festival, New Directors/New Films Festival, Tribeca Film Festival and Rotterdam Film Festival. The work is discussed in histories of cinema including the books *Documentary: A History of the Non-Fiction Film* (1993) by Erik Barnouw; *Allegories of Cinema* (1989) by David James and in a chapter by Robin Blaetz titled "Avant-Garde Cinema of the Seventies" in *Lost Illusions, American Cinema in the Shadow of Watergate and Vietnam 1970–1979* (2002) by David Cook. Brand's work has also been written about in news and journal articles by Janet Maslin, Paul Arthur, J. Hoberman, B. Ruby Rich, Ian Christie, Noel Carroll, Brian Frye and Randy Kennedy among others.

Bill Brand founded the showcase and workshop Chicago Filmmakers in 1973, and served on the Board of Directors of the Collective for Living Cinema until 1991 in New York City. He co-founded Parabola Arts in 1981 and is currently an artistic director. He has served as a member of the board of trustees for the Flaherty and is an adviser to the Orphan Film Symposium. See www.bboptics.com/bboptics.html.

INTERVIEW WITH BILL BRAND

Kathryn Ramey: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

Bill Brand: I started making 8mm and 16mm films independently as an undergraduate at Antioch College in the late 1960s. In 1969 the school hired Paul Sharits to teach in the Art Department and I started studying Film as his student. By 1971 I was his assistant and collaborator inventing and developing his installation work *Sound Strip/Film Strip*, the first of a body of pioneering pieces he came to call "locational" works. *Sound Strip/Film Strip* involved, among other things, modifying a variable-speed 16mm projector in order to rephotograph film off a rear screen. Sharits includes in his "Green Box" materials at the Burchfield Penney Art Center in Buffalo, New York, some of my own notes and diagrams as well as his narrative course evaluation of my work for the independent study that was the official framework for my work with him on the project.


ANTIOCH COLLEGE

COURSE EVALUATION

STUDENT NAME

COURSE NO. AND NAME

INSTRUCTOR'S NAME

COURSE REQUIREMENTS.

INSTRUCTOR'S SIGNATURE

INSTRUCTOR'S EVALUATION. (*)

STUDENT'S SELF-EVALUATION. (*)

INSTRUCTOR'S NOTE:

FIGURE 3.25
Bill Brand's evaluation from his Film Production course with Paul Sharits.

The text reads:

FALL 1971

STUDENT NAME BRAND WILLIAM

COURSE NO. AND NAME ART288 FILM PRODUCTION IV

INSTRUCTOR'S NAME SHARITS

COURSE REQUIREMENTS:

CREDIT WILL BE GIVEN TO STUDENTS WHO PARTICIPATE IN ASSIGNED TECHNICAL DEMONSTRATION AFTERNOON SEMINARS AND WHO

PRODUCE A REASONABLY SIGNIFICANT, INDEPENDENTLY DEFINED 16 MM PROJECT OR SERIES OF SHORT 16 MM PROJECTS.

INSTRUCTOR'S EVALUATION:
I am thoroughly pleased with your energetic and very creative collaboration with me in exploring our new rephotography system. This is the first opportunity I've had for much close team work in a personal filmmaking project and I've learned a lot from both the project and from you—this has been perhaps my most fruitful "teaching" (and learning) engagement with a student. I wish to extend to you not only "credit" but my sincere thank you for your invaluable participation.

STUDENT'S SELF-EVALUATION:
This course involved the development of, and experimental use of specialized filmmaking tools including:

- the shutterless, gripper-armless projector
- the cross-frame scratch box
- the rear screen re-photography unit
- the artificial frame line matte

Work was done in collaboration with instructor for use in four screen super-8 film, sound piece to be completed in March '72. The work has proved most interesting and valuable to me.

For the school he later purchased a Kodak Analyst projector that was capable of very slow frame rates or even stopping on a frame without burning. I think this is how Ken Jacobs made *Tom, Tom the Piper's Son* and Paul was probably looking to follow this example. I set up the Analyst projector with a rear screen and a Kodak Cine Special camera with an animation motor and wired them up so that the projector would trigger the camera and the camera would trigger the projector. I still have a copy of my drawing for the design. At this point I hadn't yet even heard of an optical printer (see Figure 3.26).

I put together this camera/projector machine to carry out ideas I had that became my film *Moment* (1972) and *Zip Tone Cat Tune* (1972). For *Zip Tone Cat Tune* I replaced the rear screen with a system that used a front screen and a two-way mirror (www.bboptics.com/moment.html and www.bboptics.com/zip-tone-cat-tune.html).

When I was offered a teaching assistantship for graduate school at the School of the Art Institute, I took the opportunity in part because I was told that they had an optical printer. However, when I arrived in September 1972 I soon learned that they were still building one. I was immediately shown the machine shop, trained in basic milling techniques and given the job of building the printer myself. The first project I completed on it was to reprint *Zip Tone Cat Tune* because I was unsatisfied with the results that I had achieved at Antioch. My next project on the machine required very precise and complex multiple

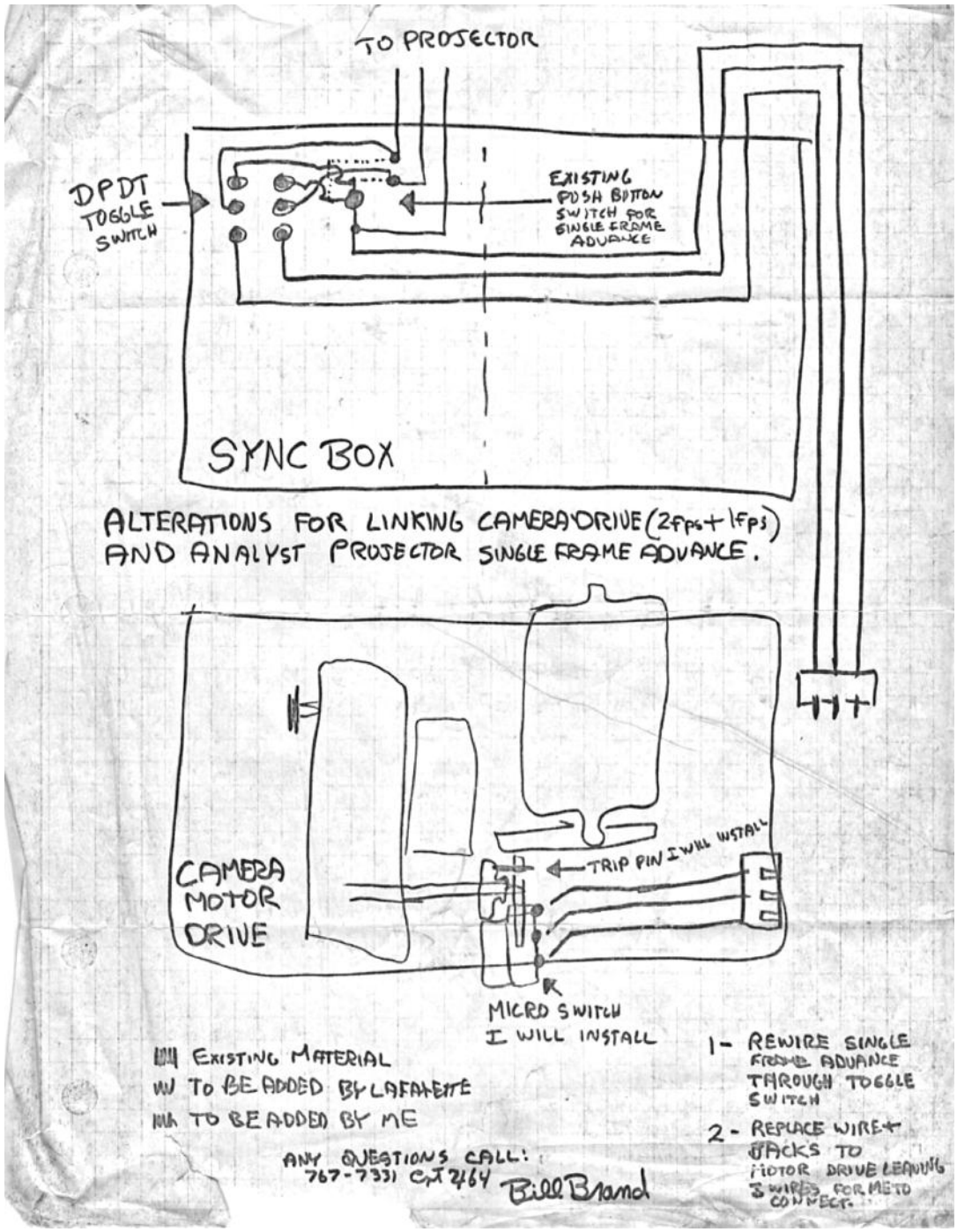

TO PROJECTOR
DPDT TOGGLE SWITCH
EXISTING PUSH BUTTON SWITCH FOR SINGLE FRAME ADVANCE
SYNC BOX
ALTERATIONS FOR LINKING CAMERA/DRIVE (24fps + 1fps) AND ANALYST PROJECTOR SINGLE FRAME ADVANCE.
CAMERA MOTOR DRIVE
TRIP PIN I WILL INSTALL
MICRO SWITCH I WILL INSTALL
EXISTING MATERIAL
TO BE ADDED BY LAFAYETTE
TO BE ADDED BY ME
ANY QUESTIONS CALL: 767-7331 Ext 264 Bill Brand
1- REWIRE SINGLE FRAME ADVANCE THROUGH TOGGLE SWITCH
2- REPLACE WIRE + JACKS TO MOTOR DRIVE LEADING 3 WIRES FOR ME TO CONNECT.

FIGURE 3.26
Drawing of the design for the Sharits/Brand printer.

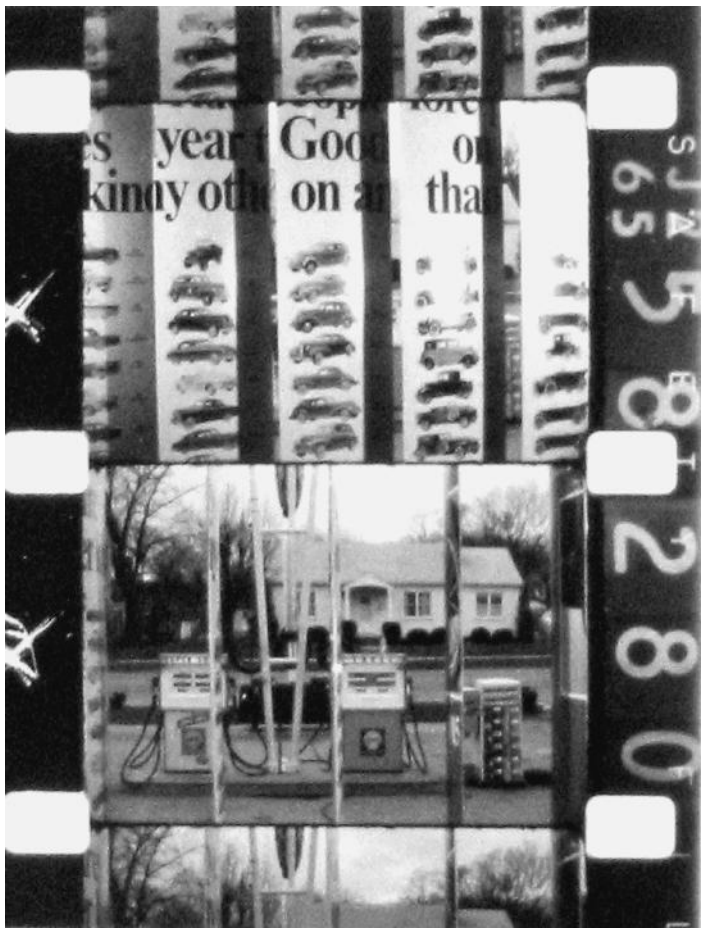


FIGURE 3.27
Frames from Bill Brand's *Moment* (1972). Courtesy of the filmmaker.

passes so I took an electronic arts course—which was really a course on basic electrical design. I designed and built a crazy electro-mechanical frame counter to control the optical printer. I used it to make *Angular Momentum* (1973) (www.bboptics.com/angular-momentum.html). The frame counter consisted of a series of ten-position rotary solenoid switches that I wired in series to allow for frame counts of up to 999. It worked pretty well but it sent out sparks for every frame and eventually caught fire just as I was completing the film!

By 1975 I had moved to New York and learned about the JK optical printer designed by Jaakko Kurhi with Larry Jordan in San Francisco. When I was invited to show my films at the Carnegie Mellon in Pittsburgh, I found out that Pittsburgh Filmmakers had obtained a JK printer and I arranged to use it while I was there. I printed *Still at Work*, one of my films in the *Cartoons* series, during that visit. I managed to purchase my own JK printer in early 1976.

FIGURE 3.28
Photo of Bill Brand with his optical printer, 1975. Photo by Robert Haller.

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

BB: In some ways media/technology/tools are only the means I've used to explore or express ideas or to see images I have in mind. For example, I set about making films with the optical printer because I already had the urge to explore ideas that required frame-by-frame manipulation of film. My first 8mm and 16mm films were animations. On the other hand, by 1971 I was influenced by minimalism and conceptualism in art and music, ideas that in film became associated with works dubbed by P. Adams Sitney as structural film. In one thread, structural filmmakers sought to make films that were precisely and exclusively about the media, technology and tools. Our approach was not "What can we do with these tools?" but instead "What are the epistemological implications of them?" So I made films that were "about" time and space, and the limits of film as an information system and a system of representation and expression. I am very curious about the differences between current artists' interest in analog film materials and techniques including the optical printer and what I was doing forty years ago.

KR: Can you be more specific about this? Are there filmmakers or particular works that come to mind?

BB: I am thinking of works, to name only a few, by Roger Beebe, Mónica Savirón, Steve Cossman and the others now with Mono No Aware, Tacita Dean, Jeanne Liota, Nicholas Rey and the work coming out of L'Abominable in France. There are artist-run film labs including L'Abominable and LaborBerlin in many countries in Europe, South America, Australia and North America that are committed to making art with analog film.

KR: One of the critiques that was leveled against Roger Beebe and myself recently—and by extension anyone who still uses celluloid—is that we are just nostalgic film festishists. Leaving aside the fact that a fetish is an inanimate object that is valued because it is inhabited by a spirit or believed to have magical powers—and thus is a rather good explanation for how much of art, let alone film art, works—what is wrong with coming back to film as a material? There are still good sculptures made with marble and paintings made with oils. It seems shortsighted to say that everything that could be understood with/through a medium has been accomplished. After all, the field of cultural possibilities has radically shifted from the 1970s. And though I wouldn't dare speak for anyone else (Beebe has an interview later in the book in which he addresses this somewhat as does Cossman), for me film as film is necessary for the kinds of critiques I am making of 20th century (mostly US) empire building and I use film as a medium to get at the way film was used to articulate, visualize, spatialize certain arguments, truth claims, etc. So to me this is very different than what was happening in the 1970s.

Of course Tacita isn't doing this. She is making BIG BEAUTY. Her work is MONUMENTAL. Cossman talks and writes about his work being an extension of a kind of environmental and social justice interest. Josh Lewis (also interviewed in this book and working with Mono No Aware) is going back to chemistry and abstraction. So, I guess what I'm saying is that, even with these few examples of people using film, they are SO different. You may agree or not agree with the politics behind the work, but you can't lump all people who use film together just as it would be absurd to lump all people who make moving images shooting on DSLRs together. Perhaps it doesn't make sense for artists who have moved beyond film (yourself, Peter Rose) to go back to it. But for kids raised on a steady diet of digital tech, going back to silver process and taking back the means of production seems really rebellious. Do you think that the work you see coming out of these independent labs is just retreading the same ground?

BB: Yes. This is exactly where I was hoping we'd go with the interview and I'm happy to follow up as best I can.

I think it's too easy to think the younger artists are retreading the same ground as my generation even if we too believe there is political and ideological content to our work. My 1984 film *Coalfields*, for instance, which uses optical printing extensively, was for me an attempt to unite abstract structural film ideas with documentary subject matter and context. Peter Gidal certainly made political claims for his structural/materialist work and theoretical writing as

did Sharits and Frampton, both of whom influence me as mentors and friends. When I say I'm curious about current artists' work, some of whom I've named, I'm not indicating I think they are all doing the same thing. I don't even think that those following very similar procedures and discovering very similar things to my generation are doing the same thing, because the ground is NOT the same. As you point out, digital culture has changed everything and working analog is an act of resistance to the *1984-for-real* culture of surveillance and self-censorship we live in. Also, structural film including my work of the early 1970s is founded on constructivist ideas leading to high modernism—ideas too that had political implications in their time. Today's artists including myself are responding to a postmodern culture, and while DIY work with analog film may be a reaction to postmodern cynicism it is no less a product of it. My optical printing work from the late 1970s to the mid-1980s was moving in this direction—looking for ways to carry forward the lessons of structural filmmaking and constructivism (especially *factura)* into other critiques of culture in line with what I later learned to call postmodern. I think I am unusual among my peers who mostly rejected structural film for underground or punk, but instead looked for the seeds of critique within the fissures of structural film work I'd already been doing for while. BIG BEAUTY was never excluded from structural film (think Anthony McCall's *Line Describing a Cone*), nor was BIG IDEA, e.g. Hollis Frampton, Michael Snow or Carolee Schneemann for that matter, as much as she was ignored at the time.

We could certainly keep digging into this subject! It's the most interesting for me as I straddle making my own new work, presenting my old work and preserving mine and everyone else's from the last fifty years and more. I started working with computers in 1969 and incorporated digital technology into my optical printing work starting in 1974. I'm currently very involved in digital preservation of film and we now really may be finally be at the end of optical printing as a viable or desirable tool for preservation. Of course, I've been saying that for twenty years and I'm doing more optical printing than ever!

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

BB: My work shows mostly in museums, in schools, at film festivals and in microcinemas. I have also made documentary works that have been broadcast on television. I have made films and videos available in a limited way on DVD and more broadly, for those who find it, on the internet. I have a very well known public artwork *Masstransiscope* in the New York City subway that has been seen by millions of commuters since it was first installed in 1980. One of the primary motives for creating *Masstransiscope* was exactly to explore the relationship between form and context/audience. While I am a teacher and believe films are best understood through exposure and knowledge, I also think they are best seen with limited mediation. This was another of my incentives for creating a public artwork.

KR: This brings me to another question I have asked a number of contributors: how do you describe to the layperson what it is that you do? What do you call yourself and your work?

BB: I call myself an artist or film and video artist. I call myself a filmmaker or experimental filmmaker, or experimental and documentary filmmaker. I call myself a film preservationist or sometimes an archivist. I usually explain that I make films that mostly don't tell stories but are artworks that are more like music, painting, sculpture or poetry.

KR: And finally, your chapter is called "Optical Printing". Please elaborate how you came to such an activity? Are you part of a community of makers (either locally or internationally) who communicate with each other about their work and get together either virtually or physically to discuss/show/celebrate? Where? When? How? What happens?

BB: I think I answered how I came to optical printing above. I am part of a community or communities of makers, scholars, activists, archivists and audiences locally and internationally. These overlapping communities consist of the loose network of experimental/avant-garde filmmakers and video artists, scholars and teachers in universities and colleges, curators, archivists, librarians and film preservationists at museums, galleries, microcinemas, libraries and archives, and artists. For me these networks are active globally, most recently in the United States, South America, Europe and China. I keep my networks active through my teaching at Hampshire College and New York University, through participation in the Flaherty Film Seminar, the Orphan Film Symposium, and the Association of Moving Image Archivists. Also important is ongoing creation and exhibition of my work as well as workshops I've offered on film preservation to artists, most recently in Uruguay and Spain. Finally, as a film preservationist and a laboratory (BB Optics) my network extends to various professional support industries for the medium including film labs, digital post-production facilities, film manufacturers and archival preservation companies.

KR: Could you please tell us about your optical work for BB Optics? How many years have you been doing this work? How has it changed as archiving film becomes more pressing? You have recently begun teaching graduate archival and restoration classes at NYU. How do these students approach optical printing differently than your arts students?

BB: BB Optics is what I called myself as a company in 1976 when I started charging for optical printing services. For many years it was only a word-of-mouth activity serving friends and acquaintances who were experimental and documentary filmmakers. Eventually, I started doing work for institutions, especially museums, libraries and archives, and I was introduced to the world of moving-image archiving and preservation where, without my knowing it, I had already developed a reputation. I have been teaching film preservation in the New York University graduate Moving Image Archiving and Preservation

FIGURE 3.29
Bill Brand's optical printer.

FIGURE 3.30
Close-up of the analog control panels.

(MIAP) program since 2005, the year its first class graduated, and while I don't train students in optical printing, they learn about its capabilities and usually get to work with me on some aspects of my work with the optical printer. At Hampshire College, where I teach undergraduates in film, photography and video, combining practice with history and theory, the optical printer is introduced as an option among many for creating art. A few students choose to pursue work with this tool and I have been available to mentor them. I occasionally teach a course that focuses more specifically on the optical printer. But this course covers a variety of artisanal practices such as analog animation, cameraless filmmaking, hand-processing and projector performance. Recently I have taught courses at Hampshire around audio/visual preservation but optical printing has not been a significant subject of the course.

KR: Can you give me the provenance of your optical printer? I remember it being something that came from various places and was put together by yourself and another. . . . As I consider the provenance of optical printers somewhat like the provenance of a violin, this is important!

BB: I bought my JK optical printer from Jaakko Kurhi in 1976. I had him adapt my Cine Special II camera for it but eventually replaced the camera with a 16mm Mitchell around 2000. In 2002 I purchased another JK printer from Michael Saunders in Canada. His father had adapted this printer working with the Canadian Film Board. It had a very good lens and the capacity to work with larger reels of film as well as 9.5mm originals. I combined the two printers to create the one I currently use that takes the features from each that I prefer. I sold the parts from each I didn't use to Carolyn Faber, who put them together. I believe she keeps this optical printer with Chicago Filmmakers.

KR: Also, do you remember the name of the poet who sold me mine? You brokered the sale, but his name is lost to time for me and it is as though I have forgotten something really important!

BB: You bought your printer from the poet James Baker Hall. He died in 2009. In the early 1980s I offered optical printing workshops through the Collective for Living Cinema and James came from Kentucky to take one, a three-day weekend offering in my studio. Some time later he purchased his own JK optical printer and brought me to Sadieville, Kentucky, to help him set up his printer and instruct him further in its use. He also arranged for me to show my films in Lexington at the University of Kentucky where he taught. See http://en.wikipedia.org/wiki/James_Baker_Hall.

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CHAPTER 4

Sound Experiments

Making microphones/ hacking toys

SOUND AND MICROPHONE BASICS

Microphones work on a very basic principle but, in order to understand them, it is first necessary to understand sound and the humans who use it. Sound is made by disturbing the air—by making it move. In our ear we have a thin membrane covering our eardrum. This membrane is very sensitive. When the disturbed air hits the membrane, it moves; these moves are registered and then interpreted by our brain. Even before we are born, as soon as our ears develop sufficiently we are building a library of sounds we recognize as well as those that we find pleasing and those that we do not. After we are born and we begin to use our eyes and ears together we associate sounds with the image of the person or object that makes them. Though sound and sensation (bodily feeling) are our very first ways of knowing and experiencing the world, our ability to identify and catalogue sound to the person or object that makes it often goes completely unnoticed. Learning to pay attention to what you hear is a big part of really understanding sound and making instruments that can help you isolate and record and/or amplify it.

At its most basic, a microphone picks up vibrations and turns them into electronic signals. If you are recording sound, your recording device encodes that electronic signal. It can be encoded as a pattern of electromagnetically charged particles arranged on a piece of flexible tape. It can be put down as grooves on a plastic disc or wax cylinder. It can be translated into a series of zeros and ones and stored on a disc or a drive. When you play it back the device interprets what it has recorded and then moves a diaphragm in your speaker or headphones to create a vibration that you will listen to and hear as similar to what you heard when you were initially recording. In an amplifier the electronic signal that a microphone makes is quite literally amplified or made louder so that it can be heard at greater volume and/or in a larger space. What the amplifier is doing is boosting the signal, increasing its strength so that it will move the air in stronger waves.

In most cases people use microphones to record specific things or to amplify speech or music for an audience. Microphones are manufactured to all different

kinds of specifications to do all kinds of different work. The part of the microphone that is sensitive to sound waves is called a transducer. Throughout the history of recorded audio there has been a variety of transducers in use and over time these have been perfected for specific applications. A microphone is usually described in terms of its transducer type—condenser, dynamic, piezo, etc., its pick-up pattern, directionality and its use. Essentially, speakers are the same thing as a microphone, only they usually function in reverse, sending out sound instead of taking it in. You are about to learn that headphones and speakers can be used as microphones. The intention of this chapter isn't to set you on a path to producing world-class recording devices (although it might, you never know) but to get you to use non-traditional items as microphones and to relish the ways recording sounds with these DIY items can increase your pleasure and interest in audio.

HEADPHONE → MICROPHONE

The most basic experiment and the one that got me and my (mostly film) students interested in DIY microphones was simply taking headphones and plugging them into the microphone input on a recording device. With the current ubiquity of personal audio gear and smart phones, most of us carry ear buds as a part of our daily life. In fact many of our devices that can play audio (phones, MP3 players, laptops) can also record audio and sometimes even have built-in software to do so. For the purposes of instruction, I will be demonstrating recording audio in this manner with an H4 digital zoom recorder, but you could record this way on your laptop, MP3 player or anything that takes an audio in. Because my audio recorder only takes XLRs and ¼ inputs, I also needed a mini to ¼ adapter (see Figure 4.1). The speaker on these headphones is very small and its amplification range is not great. Think about it: you really can't hear ear buds, even playing at full volume, more than a few feet away. So headphones are best at recording sounds close by (such as voices or instruments that they can be put inside). Because they are relatively sturdy, cheap and small, they can be fun to experiment with by putting them in unusual situations. The audio samples you can hear on the website are of me dragging the headphone across the mesh of a window, putting the headphone in a bush on a breezy summer day and putting the headphone on my engine as I start my car.

Obviously these sounds are not crisp and clear like sound effects but they are interesting and can be used to create experimental soundscapes. Try putting the microphone under an upside-down glass and then speaking into the end of the glass, or taping the mic into an empty paper towel roll or under a drum. The important thing is to experiment with making ordinary sounds into new sounds by using this inverted recording device.

FIGURE 4.1
H4 recorder, ear buds and ¼ to mini adapter.

SPEAKERS → MICROPHONE

Supplies:

- Jumper cables (cables with alligator clips at both ends).
- A salvaged speaker.
- Wire cutter/strippers (although the nimble-handed cash-strapped individual *can* get away with an X-Acto blade or box cutter).
- At least 3ft of shielded cable preferably with the adapter (mini or ¼ male plug) already attached. Preferably mono but you can make stereo work.*
- Soldering gun, solder, electrical tape, super-small wire nuts (only if you don't solder).

*A couple of things. In the world of electricity, and that includes audio, all connectors that protrude are called male, all with holes female. To my knowledge plugs that include both innies and outies are not referred to as bi or mixed or trans. Too bad. With mini and ¼ inch male plugs those with one black stripe are mono, those with two black stereo. The black stripes are plastic there to keep the signals separate from each other and the ground. Interestingly, it is impossible to tell by looking from the outside if a female connector is mono or stereo. Thus these connections must be marked.

Next we're going to try turning a salvaged speaker into a microphone. Pick-up (what you can record and how it sounds) on speakers will depend on the size of the speaker and the original range it was intended to transmit. You can purchase speakers as bare elements at electronic stores, but it is much more interesting and cheaper to salvage them from the trash or purchase them used at yard sales or thrift stores. This one (Figure 4.2) came from my friend Brian McNamee who was cleaning out his basement in preparation for a move. He had salvaged several speakers over the years and gave me a few to work with. They all came from traditional stereo speakers. Although this speaker is small, it was designed to broadcast bass and midrange signals. Tweeters (speakers designed to convey treble or high notes) will have an entirely different pick-up pattern. As you can see the speaker still has its leads attached. Although I could simply cut off the adapter at the end, strip the wires and attach a ¼ or mini plug to it, I am going to construct a set of jumpers connected to cable that can be used on any salvaged speaker I should pick up.

In order to make this cable I need one audio jumper and one salvaged mini audio cable. Audio jumper cables have alligator clips on each end and are endlessly useful. It is also useful to have a pair of wire cutters/strippers. Because I want to make this cable more durable I am going to solder my connections, but you could also use electrical tape to secure the connections and insulate them from each other. I also use a little bit of shrink tubes to cover up the welds and protect them. Again this makes the cable more durable.

The process of making the alligator clip (jumper) to mini cable goes like this:

1. First cut the jumper in half so you have equal wire attached to each alligator.
2. If you have a mini cable with something else on the other end, cut off the extra end leaving most of the cable attached to the mini plug.
3. If you have shrink tube, slip it over the cable so that you will able to use it to cover the connection. Then cut the insulation back on the mini wire about 1½". As you cut back the insulation, be careful not to damage the wires inside. Since we are salvaging these mini cables, they may be either stereo or mono. If they are mono, no problem, there will be one unshielded (bare) grounding wire and one shielded signal wire. If it is a stereo cable, there will be one unshielded grounding wire and two shielded wires. You will only need to connect one of the shielded wires to a jumper. *If* you connect both shielded wires (hots) to a single jumper lead it will only work well when plugged into a mono in. Since most of our recording devices these days have stereo ins, it is a good idea to pick one signal and cut the other. Connect your other jumper to the grounding wire.
4. Strip ½" on both of the wires coming out of the mini cable and do the same on each end of the alligator clip leads. If you are soldering, tin each of the wires from the cable and jumpers. If you are not already a solderer it is worth it to take some time practicing before you jump in.

5. When cool, twist one alligator clip to each cable wire then solder each individually. Whether you simply twist the wires together or solder them, be sure to individually wrap each connection in electrical tape and then either shrink tube the entire connection area or wrap it securely in electrical tape. If you are not soldering, twist the wires together securely and use a small wire nut or electrical tape to secure them. (Seriously, soldering is really the way to go if you want this thing to last.)

Once you have completed your jumper to mini cable, you can attach one alligator clip to each pole of the speaker. In Figure 4.5 you can see that I cut off the leads that were original to the speaker. This made it easier to attach my jumper to mini cable.

FIGURE 4.2
A salvaged speaker with leads attached.

FIGURE 4.3
Tools to make alligator clips (jumper) to mini.

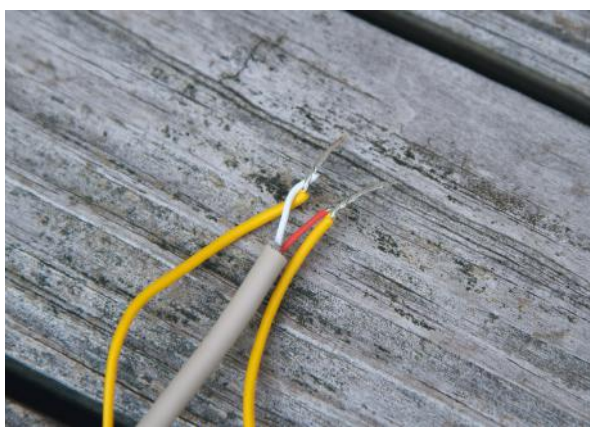

FIGURE 4.4
Twisting the wires together.

FIGURE 4.5
Recording my car with this speaker mic. Notice the shrink tube around the connection and how the alligator clips are attached to each pole of the speaker.

When recording with this particular speaker, it does a good job of recording low tones, traffic, helicopters and when the wind hits it; the diaphragm moves so much that it distorts, much like a microphone without a windscreen. Louder, closer sounds are recorded more clearly. A friend of mine, Tom Comerford, said that he once made a speaker mic out of a large bass speaker and used it to mic his drum by placing it directly against the skin of his kick drum. I thought it might be interesting to hear what it sounded like as different things fell on it (like sand and pebbles) or were brushed against it. You can listen to clips recorded with it on the website.

CONTACT MICROPHONES

To make the contact microphone you will need:

- Piezo disc.
- 6ft shielded cable (preferably with the plug you want already attached).
- (But if not) the plug (¼ inch or mini) that you want it to end in—this should fit the amp, monitor, recorder or mixer you will want to use the contact mic with.
- A soldering iron and solder.
- Electrical tape.
- Plasti Dip (optional for super durability).
- Spring clamps, doubled-sided tape or other things to attach the mic to surfaces.

Contact microphones, so called because they pick up sounds directly from contact with vibrations, are not a staple of the mainstream cinema audio recordist's arsenal. Made popular with artists by the American John Cage in the 1950s, today, outside of experimental music and performance, they are commonly used in the music industry to mic drums. In fact, when looking for the elements to construct a contact mic, you can also find the elements listed as "drum triggers".

Contact microphones are constructed from piezo discs, a small quartz disc connected to a slightly larger brass disc. When struck quartz produces electrical energy. Small vibrations picked up from the disc turn an electrical signal that can be listened to through an amplifier, mixer or recording device. Piezo discs are cheap and easy to produce, and can be found in all sorts of beeping electronics such as alarm clocks, toys and answering machines, basically anything that beeps. For more information about what to look out for when salvaging read the last section of this chapter, "Scavenging for Parts".

Piezo discs can be purchased online or at you local audio/electronics supply store. I got mine at Radio Shack™. It came with a hard plastic case that I had to carefully remove, but it also had the leads already attached, which is extremely helpful. A contact mic also requires amplification. A small battery-powered

amplifier is endlessly useful for the audio experimenter. You can purchase kits to build battery-powered amplifiers or get the parts together and follow any number of online tutorials, but I chose to get one ready-made from Radio Shack. It was cheaper and faster, and there was no soldering involved.

A caveat about soldering. If I can avoid soldering, I will. This isn't because I dislike soldering. There is something really pleasing when you make a good weld. The problem is I learned how to solder as a child and I haven't really improved my technique much since. Different people are good at different things. Soldering for me is a necessary part of making cool stuff, but not an enjoyable end in itself. I am a utilitarian solderer. As you will notice throughout this chapter, when possible, I use shielded cable with the appropriate plug already attached. This is partly to avoid soldering more than I have to and partly because it is so easy to salvage decent cables. Folks are constantly throwing out last year's electronic gear along with all the perfectly useful cables, power supplies, etc. that came with them. On the one hand I am very grateful for the free stuff, but on the other it is absolutely frightening that so much useful stuff is getting put into landfills. At least archeologists of the future will have a really easy job discerning our technology. I digress; back to contact mics.

A piezo disc doesn't really pick up sound like our ears do. It doesn't record sound made by moving air. It records vibrations. In order for it to work you have to adhere it to the surface of the object you are interested in hearing. I tried the refrigerator, my car, the sound machine I use to block out the loud sound of partying down the street. All of these things vibrate and we *hear* sound associated with those vibrations but the piezo disc hears them differently. I mentioned John Cage at the beginning of my description of piezo discs but hundreds of artists and musicians continue to use piezo discs as part of their experimental music, performance and sound sculptures. For you this microphone is a cheap and easy way to experiment further with sound.

The process

1. Whether you buy or scavenge a piezo disc I recommend you spend the time to get one with leads. Soldering leads onto the quartz can be really frustrating. If you have a disc without leads, prepare your connections by tinning the quartz and the surrounding brass each with a small dot of solder. Then cut two leads of wire and tin the ends you will attach. When you tin the disc and when you solder be very quick and careful as the disc is easily damaged. If you had to remove the disc from a device it may have leads attached to other things like a circuit board. Clip these leads to leave them as long as possible. In my case I had to remove the disc from a plastic housing (Figure 4.6). I was careful not to bend or damage the disc in the process. The disc came with 2-inch leads. I cut these back to an inch and half and then stripped about a quarter to half an inch of the ends of the leads. Once you have your leads connected to the disc and cut and stripped, tin them.

2. Now that your disc is ready, prepare your cable. Strip the shielding down about 1½″. Twist the ground so that it is wound tightly and tin. Then do the same for the signal. As I said, it is desirable to attach a (mono) cable with the desired plug already on. If you cannot, first attach the cable to the piezo, being careful to tin the leads of the wire and then connect the signal (wire connected to the quartz) and the red wire on your cable. Connect the ground (wire connected to the brass disc) and the black or unshielded wire in your cable (Figure 4.7). If you have to attach a plug be sure to adhere to these same guidelines, red (signal) to red (sometimes it is brass colored) and black or bare wire to ground (usually plain silver).

FIGURE 4.6
A piezo disc in a plastic housing. Notice the leads are already attached.

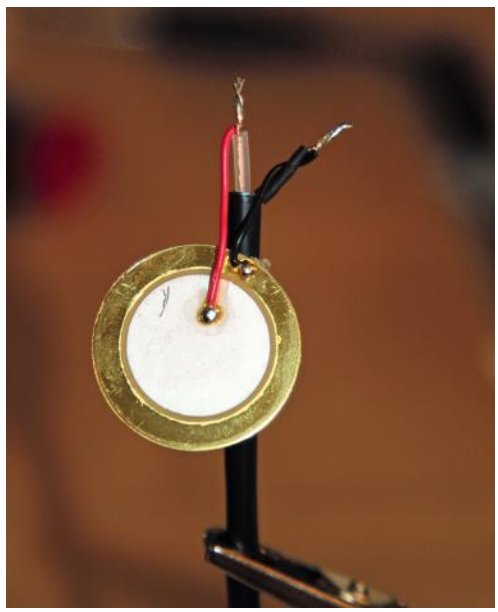

FIGURE 4.7
Attach leads on the piezo to the leads on the cable, signal (red) to signal, ground (black or silver) to ground.

FIGURE 4.8
A contact mic dipped in plasti dip to make it sturdier and impervious to water.

If you are unsure which connection is which on your plug, read the specifications that accompanied it.

3. Before you go any further, plug in your piezo disc and make sure it works. If you solder it backwards (signal to ground) there could be a significant hum. Once you are sure that it is connected properly you should do a little work to protect it. Nicholas Collins in his book *Handmade Electronic Music* (2006) recommends dipping the disc end of the mic into Plasti Dip (a liquid latex that hardens to form a flexible shell). If you choose not to do this, at the very least you should insulate your connections from each other with electrical tape and then seriously tape up the whole connection area. The benefits of dipping in Plasti Dip are that when done sufficiently it makes the mic water proof, which can allow you to put the mic in all sorts of strange, wonderful and wet places (Figure 4.8).

In order to have the mic pick up vibrations it must make solid contact with items, so it is good to have small spring clamps and double-sided tape to adhere it to a surface. You can attach it to metal and heat or cool that metal. You can attach it to slinkies or fans or anything you can think of and play that thing. You can attach it to a window or a chair and the surface will become percussive. If you dip it in Plasti Dip and make it waterproof you can put it in water and listen to it freeze.

BASIC CONDENSER MICROPHONES

Supplies for condenser microphone:

- Condenser element (stereo or mono; your choice).
- 6ft shielded cable (preferably with the plug you want to have and mono or stereo to match your microphone).
- The plug that will connect it to your phantom power if you are building your cable from scratch (mini is fine).
- Soldering iron, solder, electrical tape, shrink tubing.

So far I have told you how to make microphones that record strange sounds. It is also possible for very little money to make basic condenser microphones that have pretty good fidelity (record clear, "good" sound). Although this is probably the most "boring" item in this chapter, it is definitely the most challenging to produce, as for the microphone to function properly it requires phantom power. Building the microphone is easy; building the 9V phantom power device is complicated. Why does this microphone require phantom power? Let's go back to talking about speakers for a minute.

Back in the days of big stereo speakers and VHS tapes, we were always getting told not to set the VHS tapes on or behind the speakers. Why? Because the signal on a VHS tape is encoded in a pattern of magnetic particles arrayed on

FIGURE 4.9
The elements required to make a condenser microphone: shielded cable, the element and a bit of shrink tubing large enough to fit over the mic head.

a flexible plastic bit of tape. If you get them too close to a strong magnet, they will get all scrambled. Proof for the effectiveness of this can be seen in crime shows from the 1980s and 1990s where VHS and audiotapes holding the evidence that will surely prove the guilt of the perpetrator are magically erased by the setting of a strong magnet in close proximity in the evidence cage. Speakers (and dynamic microphones) have a lightweight membrane (remember the ear drum?) attached to a coil of wire, the other end of which is wrapped around a magnet. When the membrane is moved by vibrations in the air, the coil moves in the magnetic field and produces electrical current. They don't need any outside power to work and when properly applied can also erase your credit cards.

Condenser microphones are different. There is no magnet and they require a little voltage to get them going. That's where the phantom power comes in. Many audio recorders and mixers can actually be set or have a special input for mics that requires phantom power. It is important, however, that you don't blow out your microphone by connecting it to a source with *too much* power. If you make your own condenser microphone, when you purchase the element you will be able to read on its specifications what voltage it takes. The element I selected required a voltage (V+) 1.5 to 10VDC. That's 1.5 to 10 volts direct and this was how I determined I would need a 9V battery back.

The process

1. Prepare your cable and leads by cutting them to no more than 1½ inches, stripping the first ½ inch and tinning them. If you want to make a nice and pretty microphone like in the picture, get some shrink tubing of the appropriate diameter and put it in the cable before you prepare it.
2. Tin the leads on the condenser element.

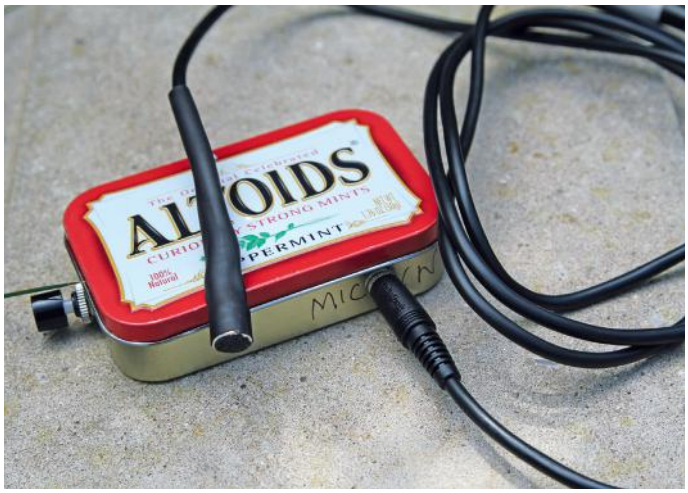

FIGURE 4.10
The completed condenser microphone with its power supply.

3. Connect the microphone and the cable leads ground to ground, signal(s) to signal(s).
4. Test your microphone to make sure it works without a hum (you may have to wait until you've built your phantom power for this) and then slip the shrink tubing up over the connections to the top edge of the condenser element, and, using a blow dryer on high, shrink wrap it!

As I've said, producing the phantom power adapter is slightly more complicated than producing the condenser microphone. It has to have a mic in, a line out AND an on/off switch. You need to put in a 9V battery snap and a capacitor and resistor. I am not an electrical engineer (my dad was) but even I know, if you're going to make something with a bunch of different things going on, it is best to draw a diagram. Here's mine drawn on a paper bag (Figure 4.11). I like to protect the surface of my work table because it also doubles as my animation table, my sewing table and my desk. Cardboard or paper bags (split open) are good for jobs like this, where you may drip solder or ink on them and they can then be placed in the recycling bin. An added bonus is that you can draw on your work surface and then recycle it when you are done!

After drawing up the schematic, I got all the materials together and laid them out in the same orientation as above (Figure 4.12). After that it was a matter of working through the device from one end to the other: tinning all the connections before I made them etc. This is not a simple several-step process and you should lay out all the materials before you begin. Once it was completed and before I housed it, I made sure to test it with my microphone. Then I put it in this handy little Altoids™ box (for some reason all DIY audio dudes use Altoids boxes so I did too). I drilled out three holes to put the on/off, mic in and line out connectors. I also lined the box with cardboard and wrapped the soldered connections with electrical tape to prevent shorting out to the metal

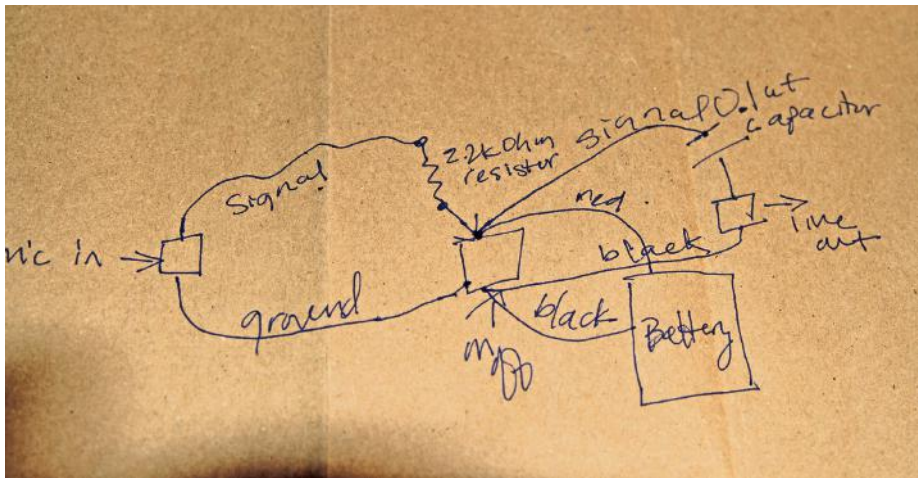

FIGURE 4.11
My schematic for a 9v phantom power supply as drawn on a paper bag.

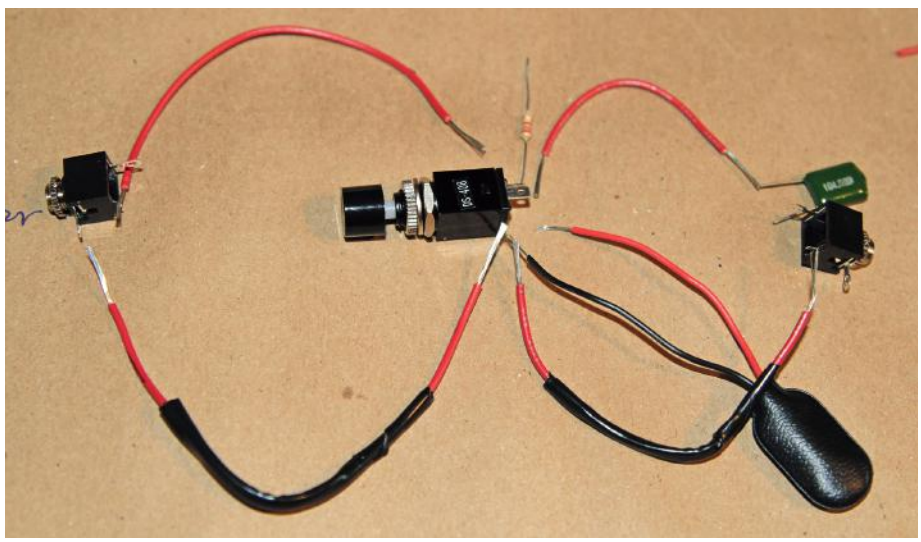

FIGURE 4.12
Laying out all the supplies in the same manner.

box I put it in (see Figure 4.13 for the inside look). Makes me think maybe a plastic box would have been better? When completed you connect the condenser mic to *mic in* (label it! You'll forget) and a regular mini cable to *line out* and into your monitor, amp or recording device! (see Figure 4.14). Sound easy? Here is the supply list and process step by step.

Supplies for 9V phantom power

- On/off switch.
- Two mini phone jacks.
- .1µF capacitor
- 2.2K resistor.
- Soldering iron, solder, electrical tape, cardboard or rubber (for insulating box).
- 9V battery lead.
- 9V battery.
- Wire for the inside connections.
- Altoids or other tin, or plastic or sturdy cardboard box that has enough room for the whole contraption and can have holes made in it for the connectors to go through. It shouldn't be too big either.
- A drill or punch or something to make the holes to put the connectors through.

The process

1. Arrange all your materials on your work surface how they will go together. When you cut lengths of wire to use BE SURE to make them long enough to get where they need to go and not so long that you can't stuff them all in whatever housing you are putting them in. Housing is KEY because otherwise they are a total mess of wires.
2. Strip half off all the wires and in all your connections and tin the wires and leads from the capacitors, resistors, jacks and on/off switch. This will take a while because there are so many connections to make.
3. Working left to right (or right to left but then read this list in reverse) start soldering the connections.
    a. This means begin at mic in and solder a red lead to the signal pole and a black (I only had red wire so I wrapped my ground leads in black electrical tape to code them) to the ground.
    b. Solder that signal (red) lead to the 2.2K ohm resistor AND the signal lead to the capacitor.
    c. Solder the other end of the capacitor AND signal (red) lead from the battery snap to the signal (red) lead of the on/off switch.
    d. Solder the ground (black) lead coming from the mic AND the black lead coming from the 9V battery snap AND the black lead going to the line out to the ground on the on/off switch.
    e. Solder the signal lead coming from the capacitor junction to the resistor lead.
    f. Solder the resistor wire to the signal lead on the line out jack.

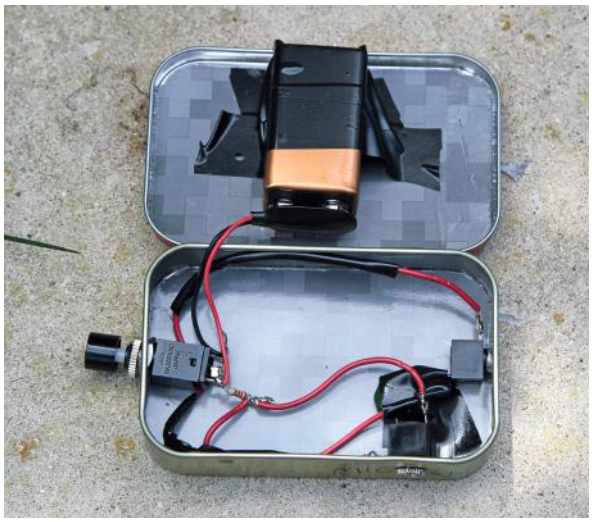

FIGURE 4.13
Inside the power supply.

FIGURE 4.14
Mark your ins and outs!

g. Solder the ground wire to the ground lead on the line out jack.

h. Plug in your battery and test with microphone. If it doesn't work compare with the schematic and go back through steps a–g. Make sure none of your connections is shorting out to each other. You can wrap them in electrical tape to insulate them.

4. If you are working in a tin box, using a bit of cardboard or thin rubber mat or a lot of electrical tape, line the bottom of your tin so that your whole business doesn't short out.
5. Figure out where everything will go in the box/tin and punch or drill holes to accommodate your mic in, line out and power button.
6. Your jack and on/off switch will have threaded collars to hold them in place. Take these off, put your on/off switch and jacks through their holes and then reattach the collars.
7. IMPORTANT! Mark your mic in/line outs on the outside of the container in a way that won't come off.

LIGHT MIC—A STUDENT PROJECT

Every so often a student will take an idea that I lob at them and go hog wild with it. A few years back a student, Chris Husta, in my Alternative Production Techniques class really got into the idea of turning *light* into *sound*. He created what he called a "light mic" that had three receptors, each filtering out a different color of the visible light spectrum. This light would fall on a photocell/photoresistor. The photocell acted like a switch: when there was little to no

light falling on the photocell (because it had been limited by the filter) it did not send a pulse to an integrated circuit. This integrated circuit was used to produce a specific frequency of sound. When light did shine on the photocell, a pulse went through the circuit and it sent a sound to the output, the speaker system. This student was so excited by the microphone that the film he produced to test it was not his best work. However, we projected another student's project over the light microphone with exciting results. You can see this on the book's website. Below is his explanation of the project with images.

Chris Husta's light mic

To construct the light mic I created three circuits using a 555 timer (Figure 4.15). The 555 timer is an integrated circuit chip that is used as a timer, pulse generator or oscillator. For my project, the chip was used as an oscillator. The frequency the chip outputs is inversely proportional to the amount of resistance and capacitance used. The schematic shows a resistor placed between pin 3 and the speaker output. In my circuit this resistor was replaced with a photocell/photoresistor. When there is little to no light falling onto the photoresistor, it limits the output; when light falls onto the photocell, the output is sent to the speakers without much resistance. This is however a very shoddy workaround. Traditionally there are correct ways of stopping or pausing the chip. By sending pin 4 (reset) to ground, the chip will be interrupted, but, when I placed the photocell between pin 4 and ground, the chip was interrupted continuously regardless of the amount of light on the cell. I assume there are a multitude of correct ways to use the application of a photocell in the stopping and starting of the chip. I however was only successful in the method I ended up using and describing above. In two of the three circuits (circuit one and two) the .1µF capacitor shown in the schematic (Figure 4.15) was switched with a 103µF ceramic capacitor. The third circuit has a 101µF capacitor. The 1K resistor on the schematic (in between hot and pin 7) was replaced by a 2.2K (red/red/orange/gold) resistor in each circuit. The resistor positioned between pin 6 and the connection between pin 7 was used as the variable that changed each circuit's frequency (see Figure 4.16 for an image of the interior of the microphone). Below is a more concise breakdown.

C = Capacitor
R1 = resistor between hot and pin 7
R2 = resistor between pin 6 and 7

CIRCUIT ONE

C = 103µF
R1 = 2.2K (red/red/orange/gold)
R2 = 27K (red/violet/yellow/gold)

CIRCUIT TWO

C = 103µF
R1 = 2.2K (red/red/orange/gold)
R2 = 1m (brown/black/green/gold)

CIRCUIT THREE

C = 101µF
R1 = 2.2K (red/red/orange/gold)
R2 = 10m (brown/black/blue/gold)

Once the circuits were wired together I placed them inside a project box. I used one 9V battery (I suggest using two because the circuit over-draws and discharges the battery at a quick rate). The photocells were placed on the outside of the project box. Snoots were placed over each photocell to manage light spill (Figure 4.17). Each cell was then covered with a different color filter (Figure 4.18): one with red, two with blue and three with green. The outputs for all three circuits were wired into one mini male headphone jack. When the circuit is activated and placed in front of a light source the tones are activated. White light activates all three tones, blue light circuit two, red light circuit one and so on. The result is a microphone that is activated by wavelength of light. A video of this microphone "in action" can be seen on the website.

SOUND EXPERIMENTS—HACKING KIDS' TOYS

Now that you've got some microphones to record it with let's do a little circuit bending and speaker twitching and all around hacking of toys. Before we do, it is probably a good idea to do a little introduction of some basic elements used in electrical work that you might be running into and basic safety precautions. The examples below are just to get you excited about getting items to generate sound and playing with them. If you want to get serious about working with found objects to make instruments please read Nicholas Collins's book *Handmade Electronic Music*. It is an amazing resource for the intermediate and advanced sound artist.

As we are just beginning our journey and I value your life and mine very dearly we will ONLY WORK ON BATTERY-OPERATED FOUND OBJECTS. It is OK to salvage speakers and microphone elements and discs from things that plug into the wall (as long as they are NOT plugged into the wall at the time of salvaging) but DO NOT EVEN THINK ABOUT HACKING A TOY OR MACHINE THAT PLUGS INTO THE WALL. That requires very advanced electrical knowledge that is completely outside the scope and intention of this book. That's not to say that *amazing* work doesn't exist in this arena. Go online and there are countless videos of people hacking video games and it is awesome. But it is not for you, not yet anyway.

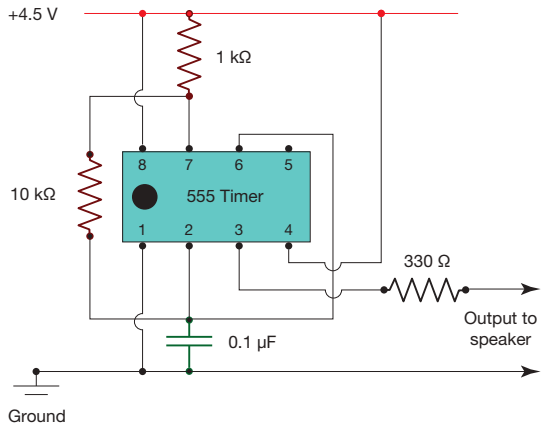

FIGURE 4.15
The 555 timer chip.

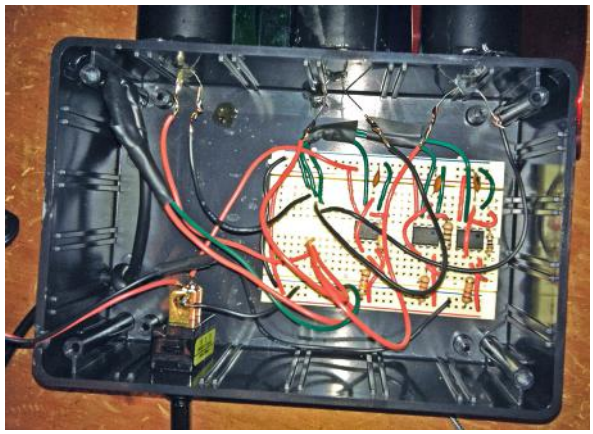

FIGURE 4.16
Inside the light mic.

FIGURE 4.17
Snoots were put over the photocells to limit the light.

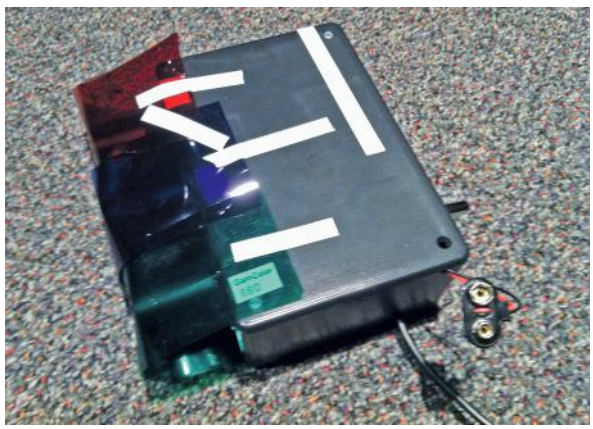

FIGURE 4.18
Filters were placed over each snoot to select a particular wavelength of light.

So, besides knowing what NOT to hack, you will need some basic knowledge of what is inside when you crack open a toy. Besides speakers and batteries you will find capacitors, resistors, circuit boards and, in toys that light up, LED lights. It is important to know what's what because crossing the wrong wires can sometimes lead to a toy to quit working. For example, when messing around on this circuit board, I shorted out the capacitor and could not make the board function any longer (Figure 4.19). Because the board was making very cool sounds before I shorted it out, I decided to cut it out of the toy and save it to work on later. What is good about this board is that it has all the things we are looking for very visible. The big barrel in the middle right is the capacitor that I burnt out. The little orange and black tube-like things with solders on

both ends are resistors. On the left-hand side of the board is a vertical row of teeny-tiny integrated circuits.

In addition to the main circuit board, I was also able to salvage a small speaker and some circuit boards with LED lights attached from this game. For fun I ganged (hooking up in a series) three AA batteries and using jumper cables was able to light up some of the LEDs (Figure 4.20). Because I want to save this to work on later, I will make a note about the batteries this circuit board requires and what I think is wrong (the capacitor needs replacing). It is important to realize that when you hack toys you very likely may destroy them. That is why using cheap or free toys when you begin is the smartest thing to do. Until you gain experience with problem-solving small electronics it is best not to invest too much money in your toys.

So let's go over the vocabulary up to this point. Resistors are little barrels that lie on their sides with wires coming out each end. We just used one in the phantom power pack. They can be easily identified (if you have the decoder) by the strips that circle them. Capacitors can be small, flat objects that look like dull chicklets with wires coming out the ends or they can be tiny little cans that are a bit fatter than resistors and do not have stripes. These can be upright or on their side with both leads coming out one end or one out of each end. Some of them are polarized in that they have a positive and a negative end, and they must be used in the correct direction. Both capacitors and resistors are used to control or narrow the flow of electronic current. When we hack toys we will be working mainly on resistors to see if we can speed up the rate at which the toy functions (that means we found the clock!) or cause

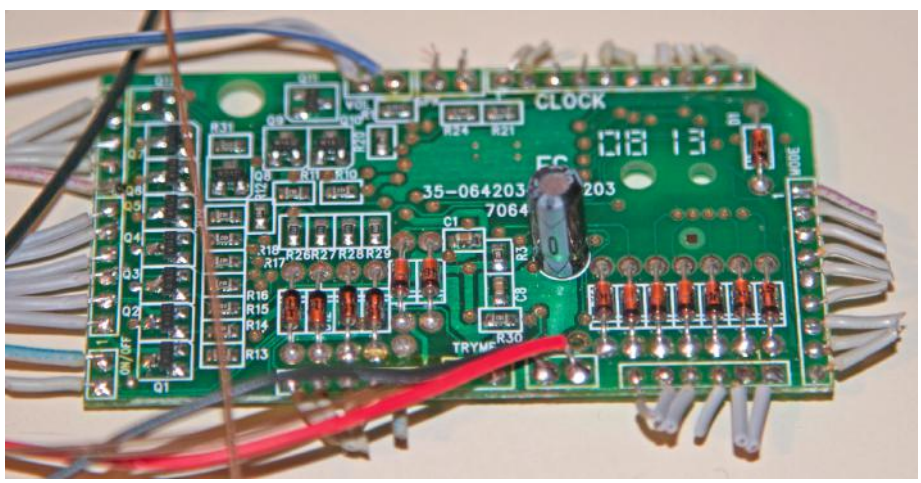

FIGURE 4.19
The black and gray barrel in the right center of the board is the capacitor, the orange and black tubes with wires running through them and solders at both ends are resistors, and the vertical row of black objects on the left are integrated circuits. The red and black leads coming from the bottom of the board went to a 4.5V (three ganged AA batteries) power source.

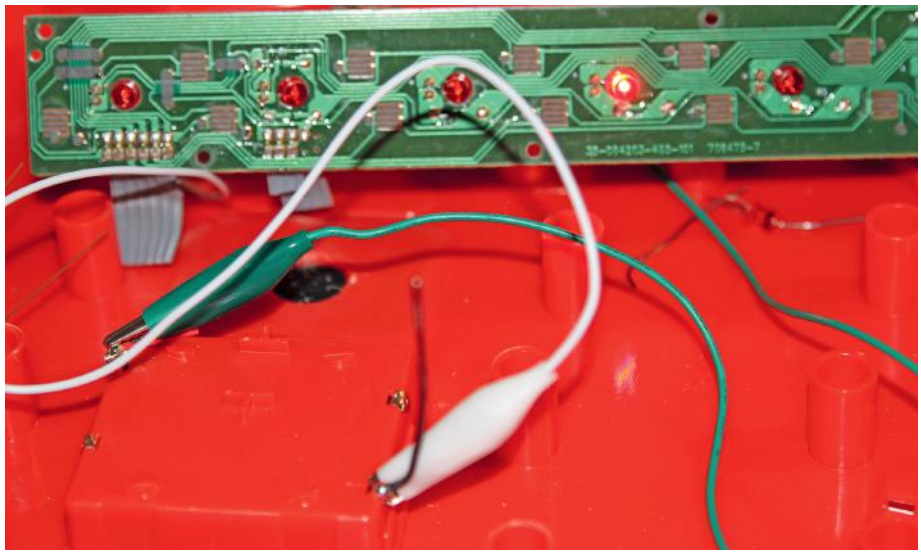

FIGURE 4.20
Lighting up the LEDs from the toy by attaching jumpers.

the toy to make strange sounds. If we find a hack or series of hacks that we like it is good to note them. It is possible to "play" a toy simply by using leads to jump across circuits but if you want to be able to reliably recreate the hacks over again you will want to do a bit of wiring and soldering to make the hacks permanent. For now let's get you tooled up for experimentation.

CREATING LEADS

So once you have a toy and it is all opened up you can start to poke around inside. One of the easiest ways to get in there and start to experiment is to lick you fingers and try to make some connections across circuits. If the board is really small or you'd rather not get your saliva all over it for some reason, you can also create leads to help you poke around. Take a jumper cable and a paper clip. Straighten the paper clip, cut it in half and stick one half in each alligator clip. This gives you leads so that it is easy to make connections with very small parts in a precise way.

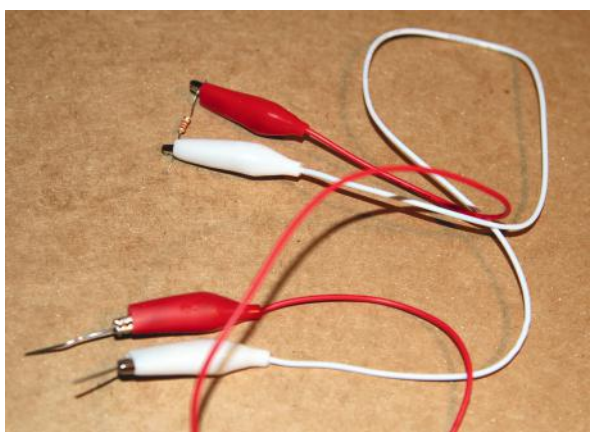

FIGURE 4.21
Leads.

SOUND EXPERIMENTS: CIRCUIT BENDING

Hacking a toy like this is also called circuit bending. Circuit bending is basically short-circuiting a toy to customize it for your artwork and pleasure. One thing you should be prepared for is that you may go through a lot of toys before you find bends you like that you can consistently recreate. Although leads are fun, it is also fun to repackage your toy into something unusual like a tin from cookies or a cereal box. If you have rerouted circuits and put in on/off switches or buttons or knobs to make the bend happen you can mount these on the exterior of the container. It is also fun to have the option of connecting your toy to a mixer, recorder or amplifier. All that requires is a mini or ¼ jack that will reroute the signal from the speaker to another source. You can either replace the internal speaker with this jack or you can get a jack that shuts off the signal to the speaker when a cable is connected to it.

KITS

So not everyone is going to want to jump into hacking but you can still experiment with *making* cool toys from kits that have taken a lot of the guesswork out of the process. These are available online or at electronic stores and can provide hours of fun and be a great way to work your way through learning soldering, circuit boards and how to differentiate between electronic elements. You can purchase voice modulator kits, sound effect kits, buzzer kits and more. Because we are using them to generate sound for projects, it isn't a bad idea to put in a jack between the battery and the board so that you can connect the device to a mixer or audio recorder. It's best if you use one that can close the circuit to the speaker. You know how when you plug your headphones into your boombox the speakers automatically turn off? That is because the headphones jack is a closed-circuit jack. When a plug is inserted into this jack, the signal to the speaker is interrupted.

Another fun electronic element you can get in a kit and then experiment with in your bent toys is a potentiometer. A potentiometer is a variable voltage regulator. When put into a kit or a toy it can change the speed and thus the pitch of the sound you are controlling. If you find the resistor that controls the sound on a toy and put in a potentiometer you can make the toy go so fast it squeaks or slow way down.

TWEAKING SPEAKERS

So the last thing I will discuss in this chapter is probably the easiest thing to do. Once you have found yourself some speakers, break out your leads and your 9V battery (or six C batteries wired in a sequence), attach a jumper to each terminal on the speaker and then attach the ground (negative) to the – (negative) on the batteries. Then take the signal (positive) and touch it to the positive on the batteries. The cone in the middle of the speaker should pop and you should hear a little something (or a big something) from your speaker.

Once you've established this circuit (don't leave it connected because your battery will burn out) connect a lead, like a paperclip or a nail, to your positive jumper. Connect a third jumper to your speaker with another paperclip or nail a lead to its end and then try making connections *through* other conductive objects by touching both leads to the same object. A metal screen, a cake pan—you should feel like you're playing the speaker as a drum. One last thing you can do is take some light things, more paperclips, sand, lentils, small shells, and put a few in the cone of the speaker. With the leads clamped onto your battery and one pole already connected to the speaker, twitch the speaker gently on the other pole, and watch whatever you put into the speaker dance.

SCAVENGING FOR PARTS

As I said in the introduction and will continue to say throughout this book, people throw away perfectly useful stuff every day. Sometimes it has outlived its intended use, but it still contains parts that can be useful to the savvy, crafty DIY media maker. You can find almost everything you need to do the work in this chapter in the trash or at a thrift store. Getting stuff free makes the whole thing even more fun. One very important rule of using salvaged parts is that you make sure there isn't a short in the cable before you go to all the work of using it to make your cool thing. How do you do this? Well, you could just plug it into a device that you know works and wiggle the cable and the connections. If there is no crackling and the sound doesn't cut out, congratulations! You have a good cable. If yes and you can isolate the bad part, usually one of the ends, you can cut it off and still use the cable. Alternately you could use a circuit tester. I have the habit of taking a circuit tester and batteries with me when I go thrifting, just in case.

The only downside of scavenging is that you end up with a lot of stuff you think you might use "some day" and, unless you live alone, your roommates/bunkmates/family are usually not as thrilled about your growing pile of supplies as you are. That is why I recommend breaking down items as soon as you get them. Open up that old fashioned "tape" answering machine and bust out the record head, the piezo discs, speaker and whatever wires or adapters look good and junk (recycle?) the rest. Scavenge storage options, little jars or plastic containers for small things, big quart size for bigger items, and label your goodies! Take all the speakers out of their cabinets (recycle the wood if you can) and store them vertically on a shelf. You might cut cardboard to divide them so the back of one doesn't harm the front of another.

When you salvage piezo discs or small speakers from toys, phones and answering machines, be very careful as you remove them. Piezo discs are fragile. Also whenever possible remove items WITH LEADS ATTACHED! Even speakers. This can save you a lot of headache later on.

Even if you don't salvage or thrift for your parts, I hope by now you will agree that making microphones that work outside the normal, everyday expectations

for recording audio is really fun. And whether you scavenge or not, you will still find yourself collecting odds and ends and tools, and making things you will need to put somewhere. So along with all the other "supplies" you need a workspace reserved for you, even if it is just a desk or table. The key is organization and, believe it or not, cleanliness. A tidy workspace is a place you can always come back to and begin working right away. Especially if, like me, you have to sew, solder, edit, type and generally do every crafty thing you do in the same spot.

CONTINUITY/VOLTAGE METERS AND BEYOND

The more you get into working with electronics, the more useful it is to have a circuit tester/voltage meter. They can be super fancy and test for amperage, voltage and continuity at multiple strengths or they can just test for continuity. A continuity tester sends a small amount (really small; you can't even feel it if you put it on your hand) through a lead. You apply one lead to one end of a circuit and the other lead to the other end. If the circuit tester lights up or beeps or does whatever that tester is supposed to do to indicate that a circuit has been made, congratulations! That part of the cable works. Now test the other parts and then test across to confirm that there is not a short. You can apply this knowledge to test all basic electronic circuits including things like electrical cords and incandescent lamps.

If you spend a little more money, you can get a circuit tester/voltage meter combination. Voltage meters can test for volts. This is especially useful if you are trying to figure out whether a battery is dead or an outlet is live. Testing across the poles of a battery you should be able to read something close to the voltage of the battery. If it is negative, don't worry. It just means you've got the positive lead connected to the negative pole of the battery and vice versa. This also works in household outlets to test if the power is on and if the outlet is putting out regular household currency (125V in the United States). If not, you may have a bad breaker or a bad outlet.

If you spend even more money still you can buy an item called an amp probe. This can test the amperage going through a wire to indicate how much power a particular unit is drawing. This only works if you can isolate the positive wire. If you clamp an amp probe around a three-strand (power, neutral, ground) wire, it will register zero (or close to) power being drawn because the energy returning from the device on the neutral cancels out the energy going to power the device. Amp probes are also useful to find out if a lot of energy is being kicked back on a grounding cable. These devices are mostly used by household, stage and cinema electricians because almost all household cables come already banded together. None of these meters is required for working with audio or electronic devices, but by now you should be able to see how useful a continuity tester and voltage meter could be.

CONCLUSION

There are two people who got me interested in building microphones and experimenting with sound, Tom Comerford, who is interviewed at the end of Chapter 10, and Brian McNamee, a friend, musician, sound engineer and all-round tinkerer. We became friends because our children attended the same preschool. For a time he taught field audio production at Emerson College and he substituted in my Alternative Production Techniques class where he instructed my students on how to build stereo microphones out of headphones. He even mixed my film *Yanqui WALKER and the OPTICAL REVOLUTION* (2009) and provided original musical sounds for it from his assortment of unconventional instruments. He is currently a studio engineer at Berkeley College of Music, Boston, Massachusetts. If this were his book, twelve out of the thirteen chapters would probably be related to sound. Although he doesn't (beyond me) orbit in the experimental film world, he has seen enough to know what it is and to appreciate it. But because his subject orientation is different than any of the other contributors in this book, I will be asking him different questions.

INTERVIEW WITH BRIAN MCNAMEE

Test. . . .

Brian McNamee: Hey Kathryn, I was reading your questions that you sent to me and I thought that since I am a practicing audio engineer I should record your answers rather than write them down. This way, maybe I won't edit myself as much, maybe I'll ramble a bit and you can decide what's important.

First, I want to give platitudes and gratitudes: it is an honor to me to be included in this group of interesting people that you've assembled. Yourself being a great artist and seeing the work that you've put together for this book it is an honor to help you out with this and be a part of this book.

[He reads the following question.]

Kathryn Ramey: You are a musician and sound engineer with a background (graduate studies) in photography. You have worked recording and mixing sound for broadcast and other applications, as a professor teaching field and studio audio recording as well as mixing, and in your current job as an in-house engineer at one of the pre-eminent schools for music (Berkeley College of Music, Boston) in the country. You also have an artist's studio that you share with other dudes and work out of rebuilding tube amps and other old gear and making music. How did you acquire the skills for these various occupations and avocations?

BM: I feel like all those different pursuits, all those different interests that I have, the short answer is that they are all just different frequencies on the same wavelength. Different areas of the spectrum, but it is all the same wavelength. That's how I try to look at it, but it's not always that simple. Or sometimes it takes a while to figure out how to make it simple or to get used to doing it.

I was studying photography and was listening to music, which inspired the photographs I was making. I did that for a while and then I started making music at the same time and then used photographs I found to inspire music. That was an early jump for me of pursuits and how they can feed each other. That led to my interest in pictures and sound, and how they could feed each other, which is film or can be or music with pictures or any other sort of media that includes different ends of the wavelength.

In terms of how I acquired the skills . . . with all the different things that I focused in on there is something about being able to focus in on something and drill down on it and do it repeatedly and try to get really good at it. When I get interested in something I can focus on it like that. These are all things I'm interested in, music, picture and sound, different ends of the same spectrum. It sounds corny but simple at the same time.

KR: What interests cross over between say photography and soldering—the basic skill set of much of your engineering work? How is mixing in post-production connected to your interest in building microphones to the music you play? In other words, how do all these interests and skill sets interact?

BM: So I think all of these different skill sets interact directly. Getting into audio professionally at a young age was the path of least resistance. I was really into cameras and into film, and I could have gone into that world. I could have gone into still photography as an assistant or something, but I just happened to get into an audio job, which I sort of knew from making music and being in bands and recording bands with a four-track. The four-track is what formed me as an engineer and probably lots of other engineers too.

If I'm really in something like audio engineering or I want to figure out how a mixing board works and how to run a microphone through it, after I've learned one end of that to a certain extent, say how a mixing board is set up or how to route audio through a mixer, once I've learned that I focus on the other side, the instruments and then the microphones. For some reason I have this obsessive need to focus in on every part of the chain of audio recording. So I've been into mixing and engineering, setting up big mixing boards, doing field audio, working on films and videos, all of that stuff was interesting to me.

But I think all of this sort of revolves around film, like around picture and sound, and I got interested in different areas of that at different times. And it came together somehow in the middle where I was doing film. Before that I was doing music, then film and then I moved on do just sound. Maybe I'll have another wave.

I never studied electronics but I got into tube amplifiers and was fascinated with the schematics. I would just sit down every single night and have a schematic and look through it and find a chart that told me what all the symbols in the schematic were and decode it. It is pretty easy; there are several symbols and you can just look them up on a chart until you remember them. I was

just interested in how they looked, how the schematics looked. The way layout diagrams looked. What the tubes were called. I just got fascinated with all that. So when I got into that I just decided I was going to sit down and look at these drawings repeatedly until they stuck in my head. And then I started applying that to building circuits.

I built a lot of models as a child. I think that was a key skill-building set for me. Probably everything I've ever done in my life comes from building models of cars or ships or tanks or planes. And then later in pubescent years, taking the same models that I slaved over and carefully painted and filling them full of gasoline and lighting them on fire. Possibly with a Ken or Barbie involved in the same inferno for human representation.

So building models, you have to cut plastic off of the sprue, that's what they call the little frame that holds the larger model pieces. You have to cut the model off, trim the cuttings that aren't smooth, finish it, paint it, possibly put it together before you paint it, depending on how you go about it. There is an attention to detail. You have to follow instructions. It's like IKEA. You have to follow instructions in a book that are just line drawings of what you are looking at; there are hardly any words, or if there are words there is a letter and a circle. A circle with a letter in it, maybe the part and maybe what you did with that part. But mostly it was just looking at the pictures and lining up how things looked in the pictures. This was engineering my brain. Model building was an early and huge part of my life, at 9, 10, 11.

My dad and I made model airplanes together and hung them up in my room. My interest in photography came from my father too. He was interested in photography and he went to Northeastern and as part of his internship at Northeastern he worked at the *Boston Globe* as a photographer's assistant. He got to go out on shoots and "assist" photographers who were staff guys, which really meant he was bringing them drinks, booze or ice or a shaker full of ginger ale out to a parking lot where they were stationed waiting for the news to happen. My father was a photographer and I have a speed graphic camera that was his that he used.

KR: When you taught audio at Emerson College, what was most exciting to you about working with students? What were the most important skills that you wanted to impart?

BM: A good part of it that I thought was interesting was that students "got it", or even if they didn't get it they were interested. We talked about things in my class that didn't have anything to do with the syllabus. We covered what we were expected to cover [in field audio] but then our conversations could range to anything that was relevant.

I thought it was interesting when kids "got it" and it was also interesting when kids didn't necessarily get what I was pushing on them, but they are still interested in something and if someone expressed an interest we would talk about it and try to pursue it in class and try to tie it into what the rest of the

class was doing. We didn't sit down in class and read a book; we went out in the world and recorded sounds, and brought them back and mixed them. What happens, what can you capture? What can you make out of that after? It was really nice in class when students got into it.

KR: For a visual artist (as most who read this book will be or aspire to be) how can they turn these interests to working with sound? How do these things interconnect for you?

BM: Being interested in photography, I was building little dioramas, miniature film sets or memory stills. After being interested in photography and through photography entering into the gallery world, or store fronts, and I got to know that part of the world, and I started to think why not pair sculpture and music and images projected onto walls and then into film. So my process was just to follow my interests and it all seemed very connected to me. So I guess my advice would be to apply the intensity and process that you bring to your visual work to your sound work, try corollary processes on your sound media as you do with your images, experiment.

HOW TO MAKE A BINAURAL MICROPHONE

A binaural microphone set-up is a pair of capsules placed in the same configuration as your ears are on the sides of your head. Recordings made with this sort of an arrangement will create a specific stereo image that is very familiar to us humans. There is a wide left to right spread with information in between that sounds very soft and natural. It's a very different feel than most modern recordings, which are made by sticking a microphone as close as possible to the sound source thus eliminating any environmental interaction with the object being recorded.

I've made a few pairs of these over the years and love the recordings I've made with them. They excel in capturing nature or environmental sound. It is also a very nice mic set-up to use for music. You can even wear the headphones while you are playing music and capture the band and the space around you as it would sound in reality.

I find it worth noting that a microphone and a speaker are both transducers—one takes electrical energy and converts it to an acoustic signal and the other takes an acoustic signal and converts it to an electrical signal.

This is an inexpensive project that requires only a few tools and components. Because there are a lot of headphone styles to choose from there is a certain part of the project where you will have to do some creative engineering to make it work. This is my favorite part of building projects like this.

Finding the ingredients for this project

- Some type of headphones that can be destroyed. You can find them in the bottom of a drawer, the thrift store, and from your local or online retailers.

Ear buds will work, as long as there is ample room to attach a mic capsule to the back of it, but most may not be able to support the weight of the capsule and may be too close to your ear to work properly. Over-the-ear headphones—with a bar either above the head or behind the ears—work very well for this application and provide a more stable base for your mic capsule. Larger earmuffs also make it easier to hide your mic capsule—should you choose to use these on a clandestine mission.

- Mic capsule. Two inexpensive mic capsules are needed for this project. You could look in your local electronics store and see if they have parts for sale. If you don't see what you need, ask someone. They may be interested in what you're building and help you out. You will then have an electronics buddy who you can refer to later when you have other projects you are working out. Or, there are the internet retailers like mouser.com, allelectronics.com, Newark.com, etc., which will carry some type of mic capsule that is suitable for this project. You should find an omni-directional capsule that requires a few to several volts of power to work. This is one I've used before: PUI Audio POM-2244L-C33-R (mouser.com).
- If you can find capsules with different directional pickups—like a cardioid capsule—you could also experiment with those, like the PUI Audio PUM-5250L-R (mouser.com).
- Other than these, you will need some basic tools:
  - Screwdriver.
  - Soldering iron.
  - Wire strippers/cutters.
  - Drill with a 1/8″ bit. This will be useful too if you have big earmuffs and are able to pass the wire through the back of the headphone case.
  - A glue gun or some type of non-conductive silicon glue. This will be used to attach the microphone capsule to the outside of your headphone case.

The process

1. The project is pretty simple. What we are looking to achieve is to pry open the headphones, remove the wires running to the speakers in the earphones and solder those wires to the back of the mic capsule we have. Keep in mind that we want to put them back together so try to pry things open as carefully as possible. Take note of how the pieces fit together because you are going to be putting them back that way. Use your phone to take pictures along the way. You can refer back to these when you are reassembling.
2. The pair of headphones I used were the type that has a bar over the top of your head and a round plastic case that holds the speaker against your ear. I carefully pried the case open to reveal the rear of the headphones and two wires soldered to the back of the speaker.

3. Carefully unsolder the two wires that you will find on the back of the speakers. One side of the headphones will probably have red wire and a bare wire, whereas the other side will have a green or black wire and a bare wire.
4. Using your wire strippers, prepare your wires so that you have enough bare wire to solder on the back of the mic capsule.
5. Next, I used my drill bit and drilled a hole through the casing that I pried off the back of the speaker. I'm going to pass the wires I just unsoldered through this hole and solder it to the back of my mic capsule.
6. The colored wires (red and green) on each side should be attached to the positive solder pad on your mic capsules, whereas the bare wires are your ground connections and will go to the negative solder pad. If the pads aren't marked with a + and – sign, you can usually see small lines running from one of the solder pads to the case of the microphone. This will be the negative or ground connection.
7. Carefully solder the wires to the appropriate pads and double check that they aren't touching each other or the case of the capsule.
8. Now it is time to figure out how to attach the capsule to the back of your headphone case. I usually use RTV silicone glue but you can also use a hot glue gun. Put a dab of glue over the hole you put your wires through and carefully stick the capsule to it. Take care to make sure your wires don't cross or bind with each other and will sit cleanly back inside the headphones when you put them back together.
9. Next, reassemble the headphones. You now have mic capsules attached where there were once speakers. You can plug these into your camera or digital recording device and start recording.

NOTE: One note about power and these capsules. They require between 2 and 10V in order to operate. Most digital cameras and audio recorders with an 1/8″ input will supply the needed voltage. If you don't have one of these, you can find plans online for building a power supply. There is an active and motivated binaural microphone community online with plenty of builders and users sharing their plans and recordings.

ALSO VERY IMPORTANT—NEVER PUT THE BINAURAL MIC HEADPHONES ON YOUR EARS OVER EAR BUDS THAT ARE PLUGGED INTO THE SAME DEVICE. THE FEEDBACK WILL REALLY HURT YOUR EARS!!!

Reference

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CHAPTER 5

In the Soup 1

Hand-processing black and white

If you've ever shot film, be it Super-8mm, 16mm or 35mm still film, you probably sent it off to a film lab to have it processed and didn't think much about what went on there unless a mistake was made by the technicians. This chapter will not only explain the basics of processing negative and reversal black and white motion picture film. It will also tell you how to manipulate the film in the process of developing to achieve interesting results as well as unorthodox film stocks to use and unorthodox ways to use common film stocks. Before we do that, although I'm sure you know everything about film there is to know, let's go through the details of the medium one more time.

ANATOMY OF FILM

What is film? At its most basic, film is silver halide crystals suspended in gelatin on a flexible base. These silver halide crystals are sensitive to visible light. Exposure to light "activates" them so that when they go through the chemical process called developing they become metallic silver. Variations in the size and amount of the crystals determine how sensitive the particular type of film is to light. In order to help the film move through the camera smoothly and minimize scratching there is usually a protective layer of gelatin over the layer of crystals. This layer is optically clear (i.e. doesn't alter your exposure at all) but sometimes has a filter that cuts out ultraviolet light. In order to prevent light bouncing around in the gate and creating unintended artifacts, most films have some sort of anti-halation coating on the back. In order to prevent static electricity building up and creating a fog when it discharges, most films have an anti-static quality built into their anti-halation backing. What it is and how it looks can vary from stock to stock. It is most apparent in color film, but more about that in Chapter 6. For now let's take a look at an extreme enlargement of a cross-section of Tri-X black and white film.

All black and white films can be processed as either negative or reversal. An image is negative when all the areas that were light in the subject are dark on the film and all that were dark in the subject are rendered light, or clear. A reversal or positive image renders the light and shadow of the subject as it

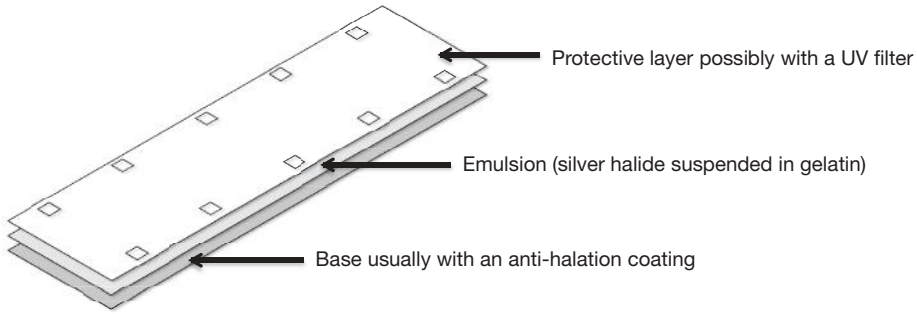
Protective layer possibly with a UV filter
Emulsion (silver halide suspended in gelatin)
Base usually with an anti-halation coating

FIGURE 5.1
This picture is not to scale. For example, Kodak 16mm Tri-X film is .07mm thick and the base is by far the thickest part of the film.

appears relative to the capability of the film stock and the ability of the photographer to properly expose the film.

You probably already knew this, but did you know that it isn't a characteristic of the film that allows a black and white image to be negative or positive? It is dependent upon the process it goes through when it is developed. Wait a minute! Some of you might say, negative and reversal films *are* different in terms of how they respond to light. And this is true, to a point. Over time film manufacturers have modified black and white stocks in various ways to get what is considered to be the best-quality image if the film is used the way it is intended. Thus black and white reversal stocks have been developed to most accurately represent the light and shadow of the image they are rendering when they are developed in a reversal process as a *positive* image. When they are

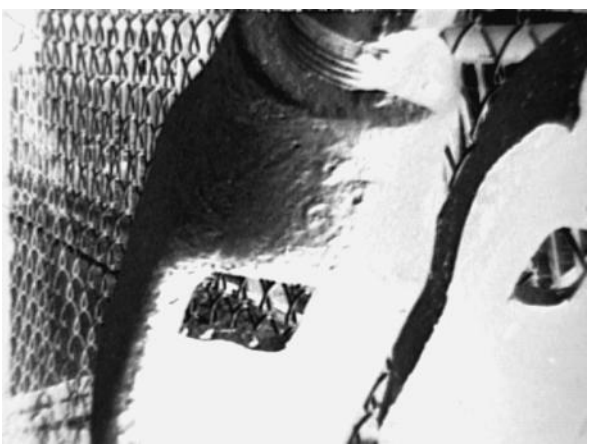

FIGURE 5.2
A negative image.

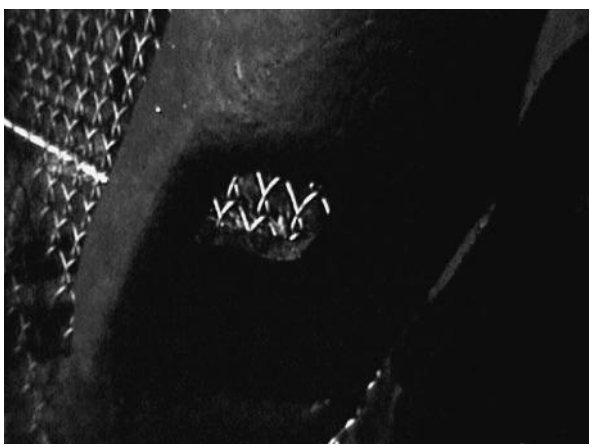

FIGURE 5.3
A reversal or positive image.

developed as a negative image, granularity decreases making the film appear grainy, and contrast increases, creating blacker blacks and brighter highlights.

Conversely, black and white negative films have been developed to have a good distribution of density across the full range of tonalities they can capture. This is because they are meant to be printed onto a complementary workprint stock, a process that increases contrast. Therefore when you develop black and white negative in a reversal process, it tends to have very low contrast, without density in the shadows or clarity in the highlights. This is referred to as looking "muddy" and is not very desirable for most filmmakers. Shooting black and white film well requires, in addition to the ability to read a light meter and set the proper f-stop on your lens, at least a passing understanding of the zone system as well as the characteristic curves and the latitude of the film you are using.

HAND-PROCESSING

Although it is possible to have your film lab cross-process, or develop your negative film as positive or vice versa, developing black and white film at home or in your community or school darkroom is faster, cheaper and infinitely more fun. We're going to start with some traditional recipes and then diverge to alternative processes. Along the way, we will learn some techniques and strategies to add additional "artifacts of the process" that you can use to enhance the graphic quality and visual interest of your film.

Before we can get to the chemistry involved we must first discuss the tools and space you will need. If you have access to a darkroom or a room you can darken completely, you can develop your film in a bucket. If you do not have access to a darkroom, it is pretty easy to turn a room in your home into a *dark* room. Find a room in your house that has few or no windows. Closets are especially good in this regard, but bathrooms tend to work well too. If there are windows, you might plan to work at night as it is easiest to make a room light tight when you don't have to worry about that pesky sun. I make my bathroom light tight (even during the day!) by taking a piece of repurposed and reinforced (I doubled the layers) cardboard cut to the size of my single small bathroom window and taped around the edges with black gaffer's tape. Then I created a "lip" of black tape around this that acts as a buffer to light bouncing in and also helps to hold the cardboard in place. Over this I hang a dark square of blanket and, if light is leaking in around that, I tape it down with the same black gaffer's tape. Important note: tape can take paint off walls and trim so be careful about where/how you tape! I used scraps from the same blanket to make a tube-shaped light stopper to go under the door to block light there (I think I filled it with beans or popcorn). That pretty much blocks all the light. Then I set up my portable rewinds on the sink and I can down-spool film in there, develop film, or contact print or whatever.

If you do not want to make a room dark or cannot, you will need to get a developing tank of some kind and a changing bag or tent (a black bag or tent

FIGURE 5.4
Exterior of a Morse tank.

FIGURE 5.5
Interior of a Morse tank.

FIGURE 5.6
16mm film loaded in the spindles.

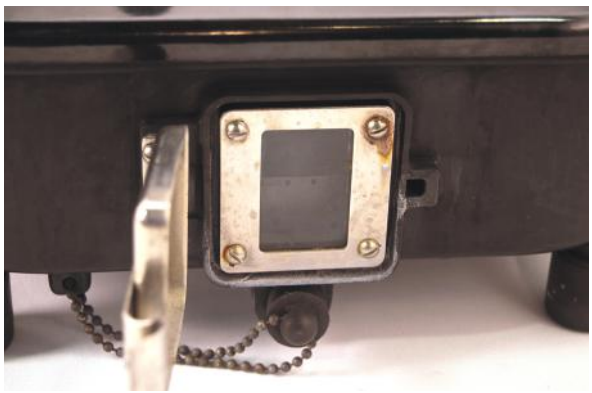

FIGURE 5.7
The door is for re-exposure during reversal processing.

that is light-proof). There are a couple of tanks designed specifically for small-batch developing of motion picture film. Although these are no longer manufactured they are still available to purchase used. One is the Morse G3 developing tank, manufactured by Morse Instruments, Hudson, Ohio, in the 1950s and 1960s. This film can process up to 100ft of 35mm, 16mm or Super-8mm at a time. The film is cranked from one reel to another and is not in the bath continuously. In order to develop the film evenly, it is essential to extend the regular immersion tank developing time to compensate for the time the film is not in the bath. This can be a bit tricky at first and I will provide some times for you to start at. As with all hand-processing, you will experiment with times and temps until you find what gives you the best results.

Another commonly used motion picture developing tank for the DIY or at-home user is the Lomo tank. This tank was manufactured in Petrograd (now

Saint Petersburg) in the old Soviet Union and is still readily available in like-new conditions via online sellers. What is great about these tanks is that because you wind the film onto a spiral reel (much like you would in still photography development) you can submerge all the film in the chemistry baths simultaneously. Thus is provides a very consistent and quick way to process your film. The only trick is that it must be loaded in the dark; loading it in a film changing bag is nearly impossible, and getting the hang of loading the film onto the spiral reels takes some practice. Also, the tanks range in size from ones that take 10m of film at a time (about 30ft) to dual 15m tanks with one reel on top of the other to process 100ft of film of 16mm (the amount on a standard daylight spool) or two 50ft rolls of Super-8 at a time. Obviously you can also process unsplit Regular-8mm film with the reels set for 16mm as it is the same width as 16mm film. It comes in 25ft lengths so conceivably you could process two rolls of Regular-8mm film on a single reel set for 16mm.

FIGURE 5.8
Exterior of a Lomo tank. This tank fits 50ft of film at a time.

FIGURE 5.9
The interior with a single reel that can be adjusted for 35mm, 16mm (or unsplit Regular-8mm) and Super-8mm.

FIGURE 5.10
The disassembled reel.

FIGURE 5.11
16mm being threaded on the reel.

During the home movie craze of the 1950s through the 1970s, there were a number of other retailers who produced tanks, reel and trough systems as well as small motorized processing units. During this time, DIY filmmakers developed other means made from equipment at hand including using a 25ft black rubber garden hose with a cork on the end to develop Regular-8mm film. Whatever the method, the initial impetus for home developing came mainly from hobbyists and was supported at least in the United States by a small industry devoted specifically to support home movie making.

Over the years intrepid small-gauge filmmakers have explored a variety of techniques to develop film with equipment readily at hand in a darkroom. Two methods that achieve relatively similar results in terms of "artifacts" left on the film are *bucket processing* and the *jam it in the can* method. Artifacts are scratches on the film, both base and emulsion, as well as unexposed areas caused by film sticking together, which are the result of the extreme handling in both of these methods. Filmmakers only develop their films this way if they want to explore the chance operations of the process. In other words, if they appreciate how this type of hand-processing leaves marks that are random and cannot be obtained through manipulating the film post-process as we explored in Chapter 1 of this book.

Jam it in the can refers to taking as much film, 16mm, Super-8, Regular-8 or 35mm, and finding the biggest tank for still processing you can and then filling it as full as you can with your film. I usually put about 100ft of 16mm in my 2L film can. The canister can be loaded either in a film changing bag or in a darkroom and the processing can be done in a sink or tub because, once you've put the lid on the can, it is light tight. So this is a very easy at-home process. Because the film is jammed tightly in a can it can touch and create areas that are not exposed to chemistry, it can get scratched or blotchy from emulsion scratched off of one area sticking to another, and sometimes the sprocket holes can be damaged so frames must be cut out for the film to run through a projector.

Bucket processing requires total darkness because the bucket itself is open so it isn't light tight. Basically you line up buckets in a fully darkened room in order of process and filled with whatever chemistry is required for that step. Wearing rubber gloves, you immerse the film in the bath for each step. This process can be a little messy. It also requires an additional person to keep time or a clock that the person developing can see in the dark but that won't flash the film. Also this process requires significantly more chemistry (at least one gallon, if not two), hyper-oxygenates the chemistry (because the film is being dunked in and out of the chemistry and the bath is open, exposing it to air) and so the chemistry is usually exhausted after one use and either needs to be tossed away or replenished. With any of the tank methods, including jam it in the can, chemistry can be reused multiple times. Both bucket processing and jam it in the can produce significant *artifacts* of the process such as scratches on the film, film stuck together, uneven processing, etc. but for many this is a

desirable outcome. Bucket processing also requires significantly more chemistry, about 8L (approximately 2 gallons) at one time, but you can develop more than 100ft at a time, if you don't mind serious detangling afterwards.

In my own film practice, I only use bucket processing when I have many rolls to develop at the same time that I wanted to be scratchy and blotchy. The most recent film that I used this process extensively on was *Yanqui WALKER and the OPTICAL REVOLUTION*. For this film I shot about 800ft of color negative 16mm, 400ft of 16mm and 200ft of Super-8mm black and white reversal, and a similar amount of both 16mm and Super-8mm Ektachrome. I wanted a very distressed look so bucket processing was perfect and I also had a large amount of film to process. Two of my then students, John McCarthy and Adaliz Guzman, spent two or three days with me bucket processing all of it. If I remember correctly we used two 5L Tetenal C-41 and E-6 kits and a couple of packets of D-19 for the black and white. It was an assembly line process and at the end of it all we were pretty exhausted, but the results were worth it. The point of this story is that, like everything else, you want to choose the process that makes the most sense for your project. If you are just experimenting, bucket processing is fine as long as you can share the chemistry between several folks or have a few hundred feet to develop.

DEVELOPING BLACK AND WHITE NEGATIVE

So, like I said before, any film can be developed as a negative image, but for clarity I will begin with discussing developing black and white negative film *as* negative. Although there has been a decrease in the variety of black and white negative motion picture films from manufacturers at the time of this writing, it is still produced by Kodak and ORWO (a German brand marketed

FIGURE 5.12
Pouring a second developer onto 16mm film "jammed in a (2L) can".

FIGURE 5.13
Pouring a fix during bucket processing of black and white negative film.

by FilmTec and available in the United States via ORWO North America). The basic process for all black and white negative stocks involves two significant steps: 1. DEVELOPING in which the silver halide in the emulsion that has been "activated" through exposure to light is turned into metallic silver and 2. FIXING in which the silver halide crystals that *were not* exposed to light are washed away. There are other steps that help to create a more evenly developed image (pre-bath), prevent cross-contamination between chemistry (clearing bath), stop the developer from working (stop bath) and prevent chemical staining and aid in the drying process (a rinsing bath like Photo-Flo). Each film manufacturer has recommendations about specific developers, times and temperatures that will do the best job for their film.

Currently there is only one black and white negative camera film stock used in the United States, Eastman Double X Negative 5222/7222 (35mm/16mm), although as of this writing ORWO is beginning to market their N74 film (ASA 400) and UN54 (ASA 100). Although the recommended chemistry for ORWO developing varies slightly, it can be safely developed with the KODAK-recommended process. We've discussed what you should wear (gloves), what you should put the film in (tanks, buckets, tubs) and where you should process (darkroom/light-tight space for open tank/tub process—bath tub or sink for tank process), but we have not yet discussed the other tools you will need. Before we get any further here is a recommended list of supplies you should get to process at home. If you have a darkroom that you can use, some of these things might already be available there so you should check before you buy.

What you will need—general processing equipment

- Gloves (nitrile/latex for most of the process, but chemical resistant for extensive time working with bleach or other nasty chemicals).
- Tank/bucket/hose—to put the film in for processing.
- Graduated cylinders in varying sizes for measuring and mixing chemistry.
- Something to mix chemistry with that is plastic or stainless steel. DO NOT USE ANYTHING THAT YOU WILL EVER USE TO PREPARE OR EAT FOOD WITH.
- A scale to measure dry chemistry (only necessary for chemistry you mix from scratch).
- pH strips (optional—most useful with alternative processes).
- Brown/light-tight jugs to store chemistry—be sure to label with what they contain to avoid contamination.
- A bucket or tub to rinse film in.
- Small glass or plastic containers to measure out ingredients before you mix them. DO NOT USE ANYTHING THAT YOU WILL EVER USE TO PREPARE OR EAT FOOD WITH.
- A changing bag big enough to load your tank in OR a totally light-tight space.

It is possible to buy prepackaged black and white developer and either use them as is or tweak them slightly to make them work better with motion picture stock. What follows is a recipe for Kodak D-96—the recommended developer for Kodak black and white negative film. Please note that it is not generally possible to purchase the ingredients for this "recipe" in a normal photo store. The best place to buy bulk chemicals in the United States is Photographer's Formulary, headquartered in Montana but with a great online store at http://stores.photoformulary.com. Please note that a 50ft × 2 Lomo tank filled with 16mm (both reels) requires 1.6L of chemistry. So you will want to double the recipe. A Morse tank requires 1L of chemistry for 16mm, 750 ml for Super-8 and 2L for 35mm.

Table 5.1 D-96 Recipe to Make 1L

Ingredient—add in order	Amount	Instructions
Water @ 125°F	750ml	Add just a pinch of sodium sulfite to inhibit Metol oxidation
Metol	1.5g	Stir to thoroughly dissolve
Sodium sulfite (anhydrous)	75g	Add ONLY AFTER Metol is completely dissolved—stir to dissolve
Hydroquinone	1.5g	Stir to dissolve
Borax (decahydrate)	4.5g	Stir to dissolve
Potassium bromide	0.4g	Stir to dissolve
Cool water to make 1L		You will want to get the developer to 72°F for developing so use cold water.

In order to develop your black and white motion picture film you really only need a developer and a fixer. I frequently use Kodak rapid fixer as it comes in easy-to-mix packages. However, you may want to save a few bucks and just mix your own. If that is your plan the following recipe for fixer is easy to make and lasts a few months when mixed if stored properly. If you ever have any doubt about whether your fixer is working, take a small piece of UNEXPOSED and UNDEVELOPED film and put it in a small film tank with some fixer for the recommended fix time. If the film comes out clear, your fixer is A-OK. If it doesn't then your fixer is spent. In any event, fixer can be used multiple times so SAVE IT! If you are working in a community darkroom and use the chemicals there DO NOT put your fixer back into the jug with fixer for the still photographers but save it in its own jug and label it so your still photo friends don't accidently use it. Hell hath no fury like a photographer whose negative is messed up because of contaminated chemistry!

Table 5.2 Kodak F-5 Hardening Fixer to Make 1L

Ingredient—mix in order and stir to dissolve before adding next	Amount
Water @ 125°F	600ml
Sodium thiosulfate (anhydrous)	153g
Sodium sulfite (anhydrous)	15g
28 percent acetic acid	48mL
Boric acid (anhydrous crystals)	7.5g
Potassium alum	15g
Cool water to make 1L @ 72–80°F	

The times and temps below are based on Kodak's fact sheets for 5222/7222 and are a good starting point for ORWO N74 and UN54. These are recommended for immersion processes only (Lomo tanks, bucket processing and jam it in the can). If you use a Morse tank you will need to compensate for time when the film is not in the bath by extending all of the times of developing. The process listed is what Kodak recommends in terms of chemistry, times and temperatures but it is certainly possible to substitute a premixed developer such as D-19 or D-76. You can either use water as rinse between developer and fixer or you can use a generic black and white stop bath. I have also included a stop bath recipe for the diehard DIYers. Stop bath literally stops the work of the developer and it does so faster than a water bath. So you may want to use it.

Table 5.3 Black and White Negative Developing Times and Temperatures

Processing step/chemistry temperature	Time in minutes: seconds
Developer D-96 @ 70°F	7:00
Stop bath or water rinse 72–80°F	0:50
Fixer F-5 (time for Kodak Rapid Fixer is about half) 72–80°F	6:00
Water rinse 72–80°F continuous water exchange or several changes of water in a tank or bath—you can add Photo-Flo at the end to eliminate dust/debris	10:00
Dry by hanging in a dust-free place	

You may not. As you begin to experiment with developing your own film, you can begin to change developing times and temperatures to: 1. manipulate the contrast of your film and 2. push or pull film that was shot under- or overexposed respectively.

TROUBLESHOOTING BLACK AND WHITE NEGATIVE DEVELOPING

If your results aren't exactly what you imagined perhaps you need to go over your processes, both shooting and in developing, and see what might have caused the problem. Below are some potential problems and their possible causes.

Table 5.4 Troubleshooting Black and White Negative Development

Problem	Possible causes
NO IMAGE	SHOOTING—extreme underexposure, variable shutter closed (in Bolex), lens cap on
	DEVELOPING—exhausted developer or insufficient developing time
NEGATIVE IS THIN (you can hardly see anything)	SHOOTING—underexposure, (in Bolex) variable shutter is partly closed, filter that is not accounted for
	DEVELOPING—exhausted developer or insufficient developing time
NEGATIVE IS TOO DENSE	SHOOTING—overexposure
	DEVELOPING—developed for too long or developer temperature is too hot
	FIXER—fixer is weak or not fixed sufficiently
	POTENTIAL SOLUTION: farmer's reducer*
NEGATIVE IS COMPLETELY DENSE	The film has been exposed to light either in shooting or before or during developing
NEGATIVE IS SOLARIZED—areas that should be clear are dense and surrounded by a halo	The film has been exposed to light during the first developer. If you like this effect go to the end of this chapter and read about experimentation

*Farmer's reducer is a solution of potassium ferricyanide and sodium thiosulfate that helps to reduce the density of the silver in a print or negative. It is possible to purchase this as a mix or make it from scratch. At the time of this writing Photographer's Formulary had several negative reducers available for purchase. The standard recipe for farmer's reducer is as follows: solution A is 7.5g potassium ferricyanide, water to make 1L; solution B is 200g sodium thiosulfate, water to make 1L. Mix equal portions of solution A and solution B to create the necessary amount for your purposes. Wet the film with water or use a fix remover if you have used a fixer with hardener on the film. You may use the reducer in the light and watch it work until your negative or print is at the desired density. Wash your film in running water for 20 minutes after use or 10 minutes with the addition of Photo-Flo to the bath. Once the solutions A and B are mixed together they will exhaust themselves in 15–30 minutes so use immediately. The unmixed solutions can last well stoppered for 4–6 weeks.

One of the first things you should check if your processing results are not what you expected are the *latent edge numbers*. All film manufacturers place edge numbers along the edge of the film. They actually print them there with light. They contain a code that tells the lab what the film stock is, and in 16mm they are placed every 40 frames (every foot) and are also used in negative cutting to match back to the workprint. When developing negative film, if you cannot see the edge numbers at all the film has been underdeveloped. If the edge numbers are there but the film is clear or thin the film was developed correctly but underexposed. Conversely, if you can see the edge numbers and the frames are dense the film was overexposed. If the edge numbers are too dark the film was overdeveloped.

DEVELOPING BLACK AND WHITE REVERSAL FILM

Many of the principles used in developing negative film can be applied to developing film as positive. I already mentioned that there are black and white films specifically designed to be developed as a positive image called reversal films. For many years Kodak produced black and white reversal film with different sensitivity to light. As of this writing they only produce a single reversal film, 7266/5266, which is 200ASA daylight, a relatively high-speed stock. ORWO produces UN54, what they call a universal stock, which can be developed as either positive or negative and has an ASA of 100 daylight.

The process of developing black and white film as positive is similar to developing it as negative with additional steps. The important steps are:

1. First developer—this changes the silver halide particles that have been exposed to light into metallic silver.
2. Bleach—this removes the metallic silver to leave a "latent image".
3. Re-exposure—the film is either chemically or physically "re-exposed" to light so that the silver halide particles in the "latent" image are "activated".

Re-exposure means opening up the can and letting in enough light to strike all the film—you cannot overexpose at this point. The rest of the processes can be done in the light.

4. Redeveloping—the "activated" silver halide particles are developed and turned into metallic silver.
5. Fixing—the silver halide particles that were not exposed to light are removed. There are additional steps such as a pre-bath that evenly softens the emulsion to allow it to accept the developer evenly, washes in between each step to avoid cross-contamination and when following the developer to stop the developing process, and a final wash with something like Photo-Flo to remove chemicals and aid in the drying process. What follows is Kodak's recommended process for developing its reversal stock 7266. This can also be used successfully on ORWO's UN54.

Both ORWO UN54 and Kodak's 7266 (Tri-X) can be developed as negative. In the case of Tri-X, developing it as negative will produce a negative with increased contrast and less definition in the mid-tones when compared with 7222. What follows are directions to develop Tri-X and UN54 as either a positive or a negative image. As you will note, when developing these films as negative, the steps are precisely the same (although times differ) as for developing 7222.

First developer

Table 5.5 D-94, Kodak's Official Recipe for First Developer in the Reversal Process

Ingredients to make D-94	Amount
Water	750ml
Elon (same as Metol)	.6g
Sodium sulfite	50g
Potassium bromide	8g
Sodium thiocyanate	9ml
Sodium hydroxide	20g
Water	To make 1L

As you mix the chemistry above, be careful as it will heat up. It is best to mix it in Pyrex if available. Also the solution is caustic to the skin so wear gloves and an apron. Kodak D-94 is the recommended developer for reversal processing of Tri-X film. However, it is possible to substitute any strong developer such as D-19 (either purchased as a mix or made from scratch) with the addition of a silver solvent. My tried and true mix for first developer is 1L of fresh D-19 with 9ml of sodium thiocynate added.

Black and white reversal bleach

Table 5.6 R-9 Black and White Reversal Bleach

Water	975mL
Potassium dichromate	9.5g (toxic, don't breath in/use a mask)
Sulfuric acid 48 percent*	25ml (BE CAREFUL! Add acid to water and avoid contact with skin. Look up material data sheet online for proper handling!)

*Sulfuric acid can be purchased from http://stores.photoformulary.com.

It is also possible to purchase a reversal bleach called Varicom II from a company called Clayton Chemical. It was necessary to purchase this in rather large amounts but it was easy for students to mix as it only required a dilution of five parts water to one part solution. Although it was possible to purchase it through B&H Photo at the time of writing they are no longer carrying it. An alternative black and white bleach as well as alternative developers and clearing baths can be found in *Processing KODAK Motion Picture Films, Module 15*.

Clearing bath (to get all that bleach off the film)

Table 5.7 Clearing Bath for Black and White Reversal Film Process

Water	750mL
Sodium sulfite	10g
Water to make	1L

For the second developer any strong, contrasty black and white developer will do. I use D-19 but be sure to have a different batch from the first developer as you do not want a silver solvent in your second developer. For fix the Kodak hardening fix listed in the negative process is fine. The times for full emersion processes (bucket, jam in can, Lomo) is as follows (Table 5.8).

TROUBLESHOOTING BLACK AND WHITE REVERSAL DEVELOPING

If your results aren't exactly what you imagined perhaps you need to go over your processes, both shooting and in developing, and see what might have caused the problem. Below are some potential problems and their possible causes.

Table 5.8 Black and White Reversal Process

Process @ 68/72°F	7266/ORWO 54
Pre-wash—water	1 minute with agitation
First developer	6 minutes
R-9 bleach	3 minutes
Clearing bath	3 minutes
Re-exposure to light	At least 10 seconds with a 100W bulb 1ft away from the film. If you can just go outside, take the lid off the tank
Second developer	6 minutes
Fixer	5 minutes
Wash	10 minutes (several water changes) + Photo-Flo at the end
Dry	Until the film is clear and not tacky to the touch.

Just like when processing negative, if you get results that you don't expect, check the *latent edge numbers*. When developing reversal film if you cannot see the edge numbers at all and the film is clear the film did not get developed in the first stage. You will notice this during re-exposure. If this happens don't even bother finishing the processing; just wash the film and use it for clear leader! If the edge numbers are there but the film is clear or thin the film was developed correctly but overexposed. Conversely, if you can see the edge numbers and the frames are dense the film was underexposed. If the edge numbers are too dark the film was overdeveloped in the first stage or did not bleach sufficiently. (See Table 5.9.)

A WORD ABOUT REVERSAL BLEACH

Bleach in the black and white film process is completely different from household bleach. It is called bleach because it removes (or *bleaches*) metallic silver from the film so that the latent image can be re-exposed to light and developed on its own. What would happen if the metallic silver *was not* removed after the first developer and the film was re-exposed to light and put through a second developer? Your film would be completely black. Both the positive image and the negative image would be on the film as metallic silver (optically dense).

Table 5.9 Troubleshooting Black and White Reversal Process

Problem	Possible causes
NO IMAGE—film is clear	SHOOTING—extreme overexposure, the film has been exposed to light either in shooting or before or during first developer.
	DEVELOPING—exhausted first developer or insufficient developing time, insufficient re-exposure to light, exhausted second developer.
	NOTE: IF YOU SEE AN IMAGE IN STEP AT RE-EXPOSURE AND THEN THERE IS NO IMAGE AFTER USING THE FIXER, YOUR SECOND DEVELOPER IS SPENT. This is why it is a good idea to observe steps 3–6. During the second developer you can actually see the image turn from gray to black as it is developed. If this doesn't happen you need to replace your second developer
IMAGE IS THIN—you can hardly see anything	SHOOTING—overexposure.
	DEVELOPING—exhausted first developer or insufficient developing time, insufficient re-exposure to light, exhausted second developer—see note above
IMAGE IS TOO DENSE—the frame is dark	SHOOTING—underexposure.
	DEVELOPING—too long in or too hot first developer.
	BLEACH—bleach is weak or insufficient time in bleach.
	NOTE: You may notice during re-exposure that your film is too dense. You can decrease the time in second developer to try to compensate.
	POTENTIAL SOLUTION: farmer's reducer
THE FILM IS COMPLETELY BLACK	The film was not exposed
THE FILM IS SOLARIZED—areas that should be dark are light with dark halos around them	The film was slightly exposed (flashed) after it was shot either before or during first developer

ALTERNATIVE BLACK AND WHITE FILM STOCKS

As of this writing there are a couple of black and white intermediate and print stocks that have been in use by experimental filmmakers for their distinct characteristics. An intermediate film stock is one that is meant to be used by a film lab for intermediate steps in finishing a film. All Kodak camera stocks begin with either a 52 for 35mm or a 72 for 16mm (e.g. 5222/7222 is black and white negative). All "lab stocks" begin with a 53 or 73. Thus 5302/7302 is a fine-grain positive film to make release prints. The stock that is the most popular with experimental filmmakers is 7363. This is a High-contrast, panchromatic film. It is not considered a camera stock and can only be purchased in 400ft rolls. So if you want to shoot it in a camera that only takes a 100ft daylight spool, you will need to spool it down.

What makes Hi-con/7363 such a desirable stock for many experimental filmmakers is its extremely high contrast. It can be developed as either positive or negative and is about half as costly as other black and white film stocks. For a camera stock it is relatively low speed, rated at about 25ASA daylight and 3–12ASA tungsten. It is extremely sensitive to shifts in color temperature, being more sensitive to blue light (daylight) and less to orange light (tungsten). The film is made to produce titles as well as traveling mattes (for more information on traveling mattes see Chapter 9) and it is extremely fine grained.

Developing Hi-con/7363 is very similar to the processes for developing 7222 and 7266, although the developing and redeveloping steps are significantly shorter. Whereas Hi-con can be developed with any high-speed developer I have had consistent results with D-19 for both positive and negative developing. Fixer, bleach and clearing baths are all the same for both processes. Kodak's recommended developer for 7363 is D-97 (see *Processing KODAK Motion Picture Films, Module 15*). This is the same recommended second developer for their black and white reversal process. In my experience there is no appreciable difference between using D-97 and D-19 (both high-contrast developers) for developing 7363 as negative and have had great success with developing 7363 in the reversal process above as well.

PUSHING AND PULLING MOTION PICTURE FILM

Just like with still photography, motion picture film can be pushed—developed longer to compensate for underexposure, or pulled—have a shortened developing time to compensate for overexposure. Pushing film increases the contrast; pulling film decreases the contrast. A general rule of thumb is that you can only go about 2 stops in either direction without significant loss of quality, but if you are a true experimenter you should feel free to try to see how far you can push or pull and how it changes your image. Pushing and pulling can be achieved two ways. You can change the temperature of the chemistry or you can change the amount of time film is left in the chemistry. The higher the temperature, the faster the film will develop. If you lower the temperature the film with develop more slowly. All of the black and white

processes discussed in this chapter are to be conducted between 68 and 72°F and an increase or decrease of 20° will significantly speed or slow your developing. No matter how you decide to experiment with pushing or pulling it is wise to test any process that does not conform to standard procedure.

EXPERIMENTAL TECHNIQUES WITH HAND-PROCESSING—SOLARIZATION

While there are endless ways you can manipulate your film in the processing, what follows are a few experiments that you might try to start you on your way. Earlier in the chapter we mentioned solarization as a potential problem to be avoided. However, in both fine-arts photography and film solarization has been used as an artistic effect. Solarizing means exposing the film to light during the developing process. This causes a whole or partial reversal with areas that should be relatively thin in the negative becoming dense. A thin line or halo around these areas can also be a part of the effect. This can be achieved with either negative or reversal developing by flashing the film with a small amount of light during developing for negative and the first developer for reversal processes. This can be done with any of the stocks discussed in this chapter. Experimentation is the key, so if you are trying out solarization you might cut your film into smaller sections and develop 10–25ft at a time until you get the effect you want.

FIGURE 5.14
A film still from *ENDLESS PRESENT: BIOGRAPHY OF AN UNKNOWN FILMMAKER a film by Cornealius Thistle*. Courtesy of the filmmaker. Note how the solarization of the film has created an image that is both positive and negative with dark outlines around some of the images, most notably the trees.

EXPERIMENTAL TECHNIQUES WITH HAND-PROCESSING—SEPIA REDEVELOPER

In the late 1800s it became popular to tone photographs with ink from a squid found in the English channel to tone them sepia. Toning has been done ever since with chemicals on prints and later with Photoshop. In motion picture film, from the very earliest days, cinematic artists such as Méliès were hand-painting their films. Tinting was also popular and was achieved on motion picture film prints by soaking the print in a bath that dyed the whole film a certain color. Toning film requires changing the metallic silver so that it isn't black any more, but a different color! One of the easiest ways to do this is to develop motion picture film and use a redeveloper that changes the metallic silver in the redevelopment phase.

Table 5.10 **T-19—Sepia Redeveloper for Black and White Reversal Process**

Ingredient	Amount	Instructions
Water @ room temperature	750ml	Put in a 1L or larger graduated cylinder
Sodium sulfide	20g	Mix in—it really stinks so do this in a well-ventilated area or outside
Water	To make 1L	Use right away or store in an airtight container

FIGURE 5.15
A film still from *ENDLESS PRESENT: BIOGRAPHY OF AN UNKNOWN FILMMAKER a film by Cornealius Thistle.* Courtesy of the filmmaker. Image with T-19, sepia redeveloper used as the second developer. Shot on 7363.

This process is most easily achieved with sepia/red tones. In order to make sepia film use the formula called T-19 as a substitute for the second developer in any reversal process, with 7266, ORWO UN54 or 7363 developed as positive. Please note, sodium sulfide stinks like rotten eggs and has been known to cause headaches if used without proper ventilation. As this is the second developer, you can watch the film as it is redeveloped. I highly recommend using this process outside or with the door open. This is a fogging redeveloper—which means that you don't need to re-expose the film to light, but you can with no ill effects. If you do decide to pop the can, you can watch as the film turns from gray/white to brown/red. This process usually takes 5–6 minutes for 7266 and 2–3 for 7363. Follow the redeveloper with a water rinse and fix as usual.

LIQUID LIGHT—PAINTING ON EMULSION

There is a product out there called Liquid Light and it is meant for photographic purposes, to make almost any surface sensitive to light and thus able to have a negative printed onto it. If you want an interesting (and somewhat unstable) film emulsion, you can paint Liquid Light onto clear leader. Once dry, the resulting film will have the ISO of photo paper (between 4–10ASA) or around the same as High-contrast film. This film is best suited for ray-o-gram work (see Chapter 8) and exterior photography, and is very fragile at all stages of the process, including developing. Its best use is for special effects that will be rephotographed using an optical printer because the original will remain more fragile than conventional film. Reprinting will also allow you to loop various effects that you especially like. One final caveat: Liquid Light is not cheap. A single bottle will only cover about 200ft of film. What follows are the instructions for making and developing the film.

What you will need to make the film

- Rockland Liquid Light photographic emulsion (you can also buy liquid emulsion from Photographer's Formulary online).
- Clear leader—acetate is preferable to Mylar.
- A couple of brushes.
- A large, clean, light-tight space to work (like a darkroom) with a big table.
- A way to heat up solutions.
- A photo thermometer.
- Stainless steel, glass, plastic or enamel containers.
- A medium amber or red safelight.

The process

Liquid Light comes with instructions, so you can read these to review the safety steps. Much of what I am about to write comes directly from them. First things first: DO NOT OPEN THE BOTTLE IN NORMAL LIGHT. This will fog the

emulsion. You should treat Liquid Light much like you treat unexposed film. When not using it, keep it in a cool, dry place. DO NOT FREEZE IT. Unopened it can last up to a year. Although this will make shooting the film more difficult, you may want to cut up your film into lengths for application of the emulsion. I usually work on a big folding table that I have set up in my school darkroom. It is about 8ft long. I cover it with a plastic drop cloth and then a layer of butcher paper. However, you should adapt your process to whatever facility you have at hand.

IN ROOM LIGHT

1. Put the unopened bottle of liquid light in HOT (but not boiling) water. Liquid Light is solid at room temperature so you need to get it to about 110°F for it to become liquid. You can put it in a double boiler situation (bottle in water—resting in a metal bowl/pan also in water in a pan on the burner) on a hot plate or boil a pot of water and pour it into a bowl and set the bottle in that. Whatever means you are using to HEAT the solution you will also be using it to KEEP the solution above 110°F, so bear that in mind. This should be at one end of your table.
2. Then lay out whatever it is you are using to cover/protect your working surface. Newspaper is fine, as are cut-open paper bags, whatever. You will recycle these later.
3. Then lay out your film in strips (or you can unroll it, loop it, tape it at both ends, make a short loop and bring it back onto the table looped close to the first line, etc.) until you have laid out the entire 100ft from a daylight spool. Make sure that you do not flip the film in this process. You only want one side of it covered.
4. TURN OFF THE ROOM LIGHTS AND TURN ON THE SAFELIGHTS.
5. Pour the Liquid Light into a stainless steel, glass or ceramic container. I find big-mouthed jelly jars are really good for this. ONLY POUR OUT WHAT YOU NEED. If you are coating 100ft of film, this is about half of the bottle of Liquid Light.
6. At this point you will want to put the jelly jar (or whatever the Liquid Light is in) into the double boiler, hot water, etc. BE CAREFUL TO KEEP THE LIQUID LIGHT WARM—BUT NOT HOT. It should be somewhere between 110°F and 135°F.
7. Using a paintbrush, paint the Liquid Light onto the film. You can also apply it with a sponge or a sponge paintbrush. You can experiment with putting on one, two or three layers. How thick the emulsion goes on depends on the heat it is at as you apply it, so one individual's single layer might be thicker than someone else's two layers.
8. Allow the film to dry. This can be facilitated by moving in a small electric fan, but as the emulsion cools it hardens and once room temperature should be firm. However, it remains significantly more fragile than commercial film so handle with care.

9. Once dry you can roll it up onto a daylight spool and put it into a camera. If you are not using it right away, keep it in a light-tight film can in the fridge. DO NOT FREEZE.

Filmmaker Robert Schaller, interviewed at the end of this chapter, has experimented more than anyone I have met with hand-made motion picture emulsion. He has his own recipe included at the end of his interview but I wanted to include a few images from his coating techniques. Figures 5.16 and 5.17 show an emulsion coating box that he made to coat 100ft of film at a time. This eliminates the need to lay out the film on a table or floor in a darkroom or coat it in very small sections. It was built rather simply with just a large pipe in the center to wind the film on and a vent and fan to speed up drying time. The other technique demonstrated was laying the film out on the side of Mt Zirkel on the night of a new moon (when there is no moon in the sky) (Figures 5.18 and 5.19). With only the stars to light their way, the workshop participants coated the film, allowed it to dry and then spooled it up before dawn. Figure 5.20 is an image shot with this film of a climber in the mountains.

FIGURE 5.16
Robert Schaller designed an emulsion coating box in which he can coat and dry 100ft of 16mm motion picture film at a time. Note: although the base could be wound up in room light, the coating and drying would be done under a safelight. Courtesy of the filmmaker, Robert Schaller.

FIGURE 5.17
Robert Schaller's emulsion coating box.

FIGURE 5.18
The coating location for *In Lightning Agnes*, Mt Zirkel Wilderness, 2014, Wilderness Film Expedition. Courtesy of the filmmaker, Robert Schaller.

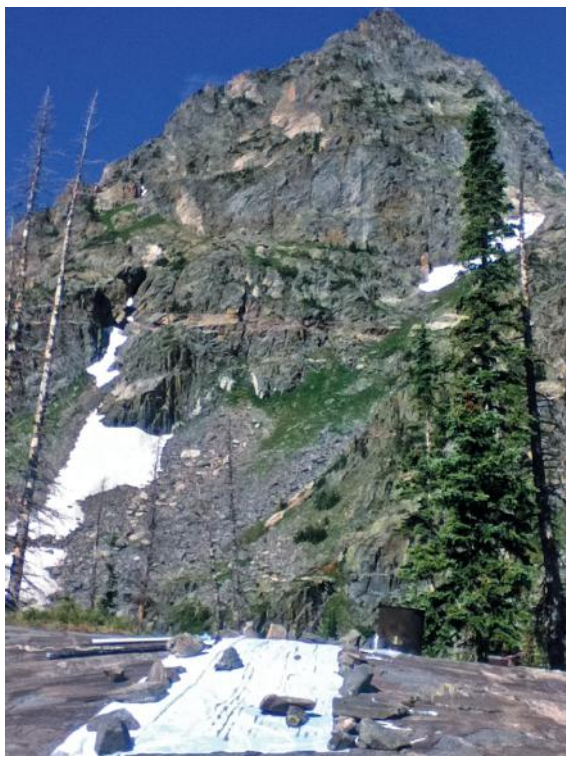

FIGURE 5.19
The coating location for *In Lightning Agnes* (available on the companion website). Courtesy of the filmmaker, Robert Schaller.

FIGURE 5.20
Black and white of a climber in the mountains; *In Lightning Agnes*, silver gelatin on 16mm (made and processed on location in the Mt Zirkel Wilderness, 2014, Wilderness Film Expedition). Courtesy of the filmmaker, Robert Schaller.

SHOOTING THE FILM

As I mentioned earlier, film made with Liquid Light is really SLOW—around 10ASA daylight. So use it outside on a sunny day and/or under-crank it (film at speeds slower than 24FPS). Remember, you will probably want to rephotograph this on an optical printer so you can manipulate speed changes then (photograph film shot at 12FPS on 2s—shooting 2 frames of every 1 frame—and make it look like it was shot at 24 FPS). Still, and this is important to remember, there is nothing normal about this film. You're not trying to get a lab look. This is a unique, hand-made process. Also, if you kept the film in the fridge, take it out an hour or so before you intend to shoot it so that it can get to room temperature.

DEVELOPING THE FILM

This film process really only works well when used to create black and white negative images and can be processed with either D-19 or a Dektol solution. In terms of processing times and temperatures the most important thing to remember is to keep all chemicals AT OR BELOW 70°F. Anything higher and you run the risk of your emulsion sliding off your film. Hand-made film is a really good candidate for Lomo tank processing (as opposed to Morse tank, jam it in the can or bucket processing) because the emulsion is so soft and fragile. If you don't have a Lomo, but have access to big paper trays, consider putting your developer in a tray and gently unspooling the film in that in large

Table 5.11 Developing Hand-Made Film

Process	Chemical	Time
DEVELOPER OR	If using Dektol use in a 1:2 solution with water	2 minutes
DEVELOPER	D-19	2 minutes
FIX 1	Kodak rapid fixer or other developer with hardener (this will strengthen your film)	Use fixer as a stop—instead of water or acid stop as both will soften the emulsion. This should be dumped after the process. 1 minute—dump this fixer
FIX 2	Kodak rapid fixer or other fixer with hardener	4 minutes—this fixer can be reused
WASH	Water—cool	10 minutes
DRY	Cool—room temperature	Hang until dry

loops. This will shorten the life of your developer but save your film. The processing times/temperatures are shown on Table 5.11. Remember these are starting points, and you will need to experiment to find what works best for you.

LAST NOTES ABOUT HAND-PROCESSING

Don't be so eager to get out of the darkroom that you forget to wash your film. You may like the chemical stains on the film, but your skin won't. So wash wash wash your film, 20 minutes or so with free-flowing water. Bath tubs are good for this. If you don't have that, a big tub or bucket that you can change out the water a few times will work fine. Adding a few drops of Photo-Flo to the water never hurts. When your film is done, hang it up to dry in as dust free a space as you can. Once it is dry, it might be a bit brittle, so get a little film cleaner (available at most high-end photo stores or online) and a dust-free cloth, put on your latex or nitrile gloves, put a little film cleaner on the cloth and run the film between it to clean and lubricate it. It will make the film much easier to handle.

Hand-processing film has been an essential part of my filmmaking process for over 20 years. I just love the artifacts of the process, the scratches, the solarization, when film sticks together, all of the mistakes that would make a clean film fan stress are what I look for. In part this is because I think of film as a sculptural medium. One that both sculpts light when you project it, but also sculpts on the surface of the film. Rapid-fire etching? In any event, a fellow traveler and teacher in this hand-processing world is Robert Schaller. He runs workshops around the country and a camp every summer, and has lately been experimenting with making emulsion by hand. When the apocalypse comes and we can't buy motion picture film from the commercial vendors any more, having the knowledge to make it ourselves will keep us all shooting. What follows is a brief interview with Mr Schaller followed by his very own recipe for hand-made emulsion.

BIOGRAPHY OF ROBERT SCHALLER

Robert Schaller is the Director and principal teacher of the Handmade Film Institute. He received his MFA at the University of Colorado with Stan Brakhage and Phil Solomon. As a faculty member at the University of Colorado in the late 1990s, he developed a course entitled "The Physical Properties of Film", which was refined there and subsequently in teaching at the San Francisco Art Institute and at the San Francisco Film Arts Foundation. The Handmade Film Institute was founded in 2003 to expand these ideas, and currently offers workshops, retreats and residencies at numerous locations in the United States and elsewhere. His artistic work and involvement in the Institute unite his background in chemistry (he was a molecular biologist early on) with his interest in time-based art and his love of teaching. His films have won numerous

awards and have been screened widely in the United States and around the world, as have those of his students (including the prize for Technical Innovation at the Ann Arbor Film Festival, won by former student Zachary Schueren in 2000). He has, additionally, made teaching appearances at the University of Florida, Gainesville, Florida Atlantic University in Boca Raton, Pitzer College in Claremont, California, and at the University of San Francisco. He has worked extensively with integrations of different media with film, including musical composition (he is a composer), modern dance, theater, installation, kite-making (the ongoing Aerial Cinema Project) and performance, in addition to the creation of emulsions and hand-made techniques.

BACKGROUND AND STATEMENT OF PURPOSE OF THE HANDMADE FILM INSTITUTE

The Handmade Film Institute was started in 2003 in recognition of the value of motion picture film as an artistic medium whose existence, given the changing landscape of moving-image technology, can no longer be taken for granted. The Institute's mission is to preserve the knowledge and technical ability necessary for working with the medium of film, and to promote both the aesthetics of film and experimentation that further expands the techniques used with and within the medium. To this end, the Institute is pursuing several courses of action:

1. To collect any and all information about film chemistry and make this information available to artists who would work with film.
2. To offer regular workshops, retreats, residencies and classes that convey this information and how to use it safely, as well as to provide time and a place for groups of like-minded filmmakers to share and create.
3. To collect the physical resources necessary to the production of film, as these resources may soon be commercially unavailable.
4. To be a focal point in the community of artists who choose to work with film in times to come.

The Handmade Film Institute makes only the assertion that film is a beautiful medium in its own right, and as such warrants preserving as a viable artistic medium. Film represents an enormous technical and aesthetic achievement, and is in many ways a crowning glory of industrialism and science up to the late 20th century. Like oil painting in the age of photography, it offers the artist creative possibilities that cannot be fully duplicated by any other means, particularly in its unique combination of the tactile and the ephemeral. Claims as to the essential superiority of this or any other imaging technology are simplistic; all media have their place, and precisely that insight underlies our formation. See www.handmadefilm.org.

FIGURE 5.21
Image from *To the Beach*, gum print on 16mm, 1999. Courtesy of the filmmaker, Robert Schaller.

INTERVIEW WITH ROBERT SCHALLER

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a new media practitioner, a shaman, a performer? How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

Robert Schaller: As you are no doubt aware, English doesn't have a good word for this. An experimental filmmaker is a difficult thing to describe to anyone else, and perhaps even to oneself. I often say that I'm a filmmaker when asked what I do by "the guy next door", but this leads inevitably to the question "What films have you made that I've heard of?" or the like, and I immediately have to explain that my films are like poems to the novels seen in a theater, that I make things that are typically non-narrative and short, in which representationality itself may or may not be present, and in which the degree of recognizability is itself one of the dimensions I use to create temporal form. I take it on myself to be something of an ambassador whose job is to explain a world, which most people have not only never seen but never imagined. I use analogies to music and poetry, both of which are often non-representational and concerned with the subtleties of surface, as I am. I try to explain in whatever terms make sense to the person I'm talking to, as long as they're interested in talking about it.

This conversation applies to anyone, really; how interested the person I'm talking to, determines how far it goes. I suppose what I'm doing is really answering the question to myself, trying to define in words what I do that really doesn't involve words. It's like what Robert Frost reportedly said once when asked to explain a poem: "What, you want me to say it less well?" I am drawn to what for me is a fundamentally wordless medium, and so it is always a case that whatever I say about it is both a struggle and beside the point of the work itself. Nonetheless, I am convinced—increasingly, as I get older—that it is important to try to talk about it. Even if the description is less good than what I'm describing, even if it's hard to talk about. I do not believe that meaning requires language—I would hold my work out as proof that this is not so—but it is also true that language is important to human beings, and is the primary way we have of understanding the world.

I am as much a mystery to myself as to anyone else, and I take seriously any opportunity to try to figure it out. If it helps bystanders understand me or anything else, so much the better, but it really doesn't matter, except that I try.

Depending on how the conversation goes, I will often say that really, I'm an artist, but I usually don't start that way. And really, in the end, I would have to say that I'm an artist who works with film. But this seems evasive to say, and not to say very much!

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your

form and method change as you go and, if so, where have you been and where are you going?

RS: I came to my practice by wanting to be everything I am at once: it is, at root, a reflection of a drive to be a single, individuated, whole being, a union of what I am both intellectually and physically.

In more concrete terms, in my youth I was trained as a scientist, and employed as a molecular biologist; I then turned to composing music after deciding to do something that mattered (science was, in my estimation, ill equipped to answer questions like that), and then, on something of a dare from an old friend, took a filmmaking class ("It's like writing music!"). I was hooked initially by the possibility of applying ideas about musical structure to image, and then by revelations about the photochemical process itself, that it was not just a given, but could be reinvented in as many ways as could be imagined.

I landed on filmmaking because it offered a platform on which I could combine a wide array of interests, and thus engage me on many levels: it involved chemistry, photography (I loved taking photos in the mountains on long wilderness trips with my father), involved being outside, in a lab, using machinery, using my body, creating physical objects, creating abstract forms that were completely immaterial, like thought; it allowed a way to explore issues of aesthetics, ethics, politics, history, culture, religion, mathematics, anything I thought of. It gave me a way to be in the world such that I could make sense of all the disparate threads that pulled me in so many directions and create singular works that I could share with others.

It also gave me a way to incorporate new ideas; in fact, it encouraged the incorporation of new ideas. A big influence was a teacher at the University of Colorado (Melanie Walker) who taught a class in alternative photographic processes, which is funny because I never took her class, but just heard one phrase: "non-silver photography", and just hearing this term turned my world over, made me realize that nothing was fixed but everything could be reinvented.

So yes, it's been a series of experiments, in that filmmaking for me is an engagement with the unknown, a way to enlarge the circle of awareness and competence. I don't know how exactly I'll be practicing in ten years, or twenty; right now, I'm spending some of my time focusing on learning to play the piano at least competently. It is an end in itself, of course, but how it fits into my life is perhaps telling, and indicative of how all roads lead to Rome: I will write music better, and be able to play it with my own films, in a form for now that I think of as "Chamber Cinema", chamber music for classical instruments and film projector, in which I write all of it. That film allows such things is a good predictor that I will be doing this for a long, long time, expanding and stretching the notion of what filmmaking is to accommodate whatever interests come my way. It's a big tent, as they say, and I have no reason to leave until it can no longer let my ideas live.

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools/and what your work is about? Is your work about something(s)?

RS: This is, I fear, a somewhat involved answer. Sorry! I have a complicated relationship with technology, or, rather, a simple relationship, but one that apparently differs from the attitudes that prevail in our society. From my point of view, technology is a tool that helps us do what we want. However, it would be naïve to think that it doesn't play a role in defining the range of what we see as there to want; it helps not just to fulfill desires, but also to create the desires that we have. Film is a good example of this. It is inherently technological, both chemically and mechanically. It was created by technology, by industry, and can't exist outside of it. Moreover, it was created to serve both capitalism (profit seeking) and conventional ideas of image and representation. Yet, it suits our condition in ways that transcend the impulses that gave it rise, our dual nature as embodied and ephemeral beings. Digital technologies do a better job of serving these official ends, and so film is being left behind in the marketplace and in society at large, yet, it continues to exist, the stubborn child of aims that have found other *serviteurs* [author's note: Fr. servants], one that by accident creates what I consider a perfect nexus of the material and the ephemeral.

I am a materialist: I don't see any reason to think that there is mind or soul without body. So too is film: the lovely immaterial image we see projected on the wall can't exist without the strip of celluloid and the machinery that projects it. It grants the opportunity to create a strip of tangible "pictures", an actual physical thing you can touch, a thing that you can make with your own hands, that responds to whatever scientific understanding you bring to it, that you can develop with your own hands, that responds to physical force in the same way your body does, that gets wet, dries, gets scratched, can be handled roughly or gently, subject to the accidents and whims of how conditions effect a nature too complex to fully understand, just like us—yet this strip, put into a projector, transcends itself. It becomes a luminous spirit, as immaterial and really inexplicable as the spirit within us, unreal, yet the only reality that matters. It's a perfect medium! I feel like I'm in relationship with it, not using it nor being used by it. For me, it is very unusual in occupying that status. I would love to interact with everything so equally. With film and filmmaking, it's a dance.

I do not eschew other technologies; I have a day job as a computer programmer, write computer programs to control machines to help with my filmmaking, create QuickTime movies to visualize rhythms and sounds. I build and maintain my own websites. I enjoy inventing and building all manner of apparatus for filmmaking, and living in general: collapsible blackout shutters for darkroom windows, rotating tubes for emulsion coating, an emulsion noodle washer that is light-proof and allows the water to be cooled, pin-registered printing frames for contact printing strips of film, a device that's evolving into a home-made computer-controlled optical printer, a 16mm pinhole camera that has been my

principle shooting tool for the last ten years. I enjoy creating the devices that I then use in my artistic work; these things are just tools, but because I make them, the whole process is part of the process of making, and my relationship and my work's relationship with the material world is more explicit and more clear to me.

I am of the material world, and so is my work: at all stages, from conception to projection, I try to be involved with the underlying materiality on which I and the work depend, and try to know it and respond to it, so that both I and the work are in constant conversation with each other and with the world.

I use computers, but I am aware that they would use me if I'm not careful. I do not use social media, and I consider much of what happens on the internet to be fraudulent and exploitative, and the companies that have come to dominate it—Google and Facebook etc.—to be taking cynical advantage of human nature to gain wealth and power over others. I am not sanguine about where this will lead us as a society and a species; I find it hard to be optimistic when smart people sign up for email accounts that openly disclose that they will read every word you write, and dismiss any concern about it as if it doesn't matter.

I prefer to make things myself, to control, as best I can, the means of my own production. I do not make everything I use, and don't really aspire to do so. Making a significant part is enough, mostly just those things that nobody makes in the way I think they should be made. This slows me down, undoubtedly, but I don't want to be beholden to what plugins are available or what device Sony just came out with. I'm not pure, but I try to be engaged.

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

RS: My favorite way to show work is to be present at the screening. I enjoy talking about it, and although most of my films have moved the locus of performativity to the act of filming rather than to the screening, my recent interest in Chamber Cinema marks a turn toward the performative in screening, and my being present becomes a significant part of the experience. Many of my films work on their own, though, and increasingly my work is getting shown without me.

KR: And finally, finally—is there a process, project, recipe, assignment you'd like to share with the readers?

Robert Schaller's silver gelatin emulsion—basic recipe: unwashed emulsion

This is an extremely simple but highly effective recipe. It produces a slow, blue-sensitive emulsion (≤ ISO 4–12). It works well for contact printing, or use in a camera in sunlight. It seems to have a sensitivity rather like Kodak 7363, or Hi-con, which I shoot outside all the time. The usual advice about using slow

films applies, with a twist: if you want to use it in a camera, bear in mind that the fact that it's only sensitive to blue light means that it won't reproduce things the way your eye sees them, and requires a light source with lots of blue light like the sun. A light meter will be deceptive, because the equivalent amount of tungsten light probably won't work. We haven't tried it with HMI lights or fancy fluorescent lights; let us know if you try it! You might also need to undercrank. To make a faster emulsion takes more work. For that, have a look at: www.handmadefilm.org/research/tiki-index.php. Making a faster emulsion is one of the questions we're trying to answer. For a slow film, however, it works well, so well, in fact, that it doesn't seem necessary to make anything more complex.

For everything that follows, use distilled water, and rinse all implements with distilled water before use. Cleanliness is essential!

Solution A—mix separately (in normal room light):

Table 5.12 Solution A—Hand-Made Emulsion

Gelatin (Knox brand (or equivalent) plain, unflavored food gelatin, from the grocery store)	10g
Potassium bromide	8g
Distilled water	62.5ml
Add the gelatin to the water and allow to swell. Put the container (preferably stainless steel, like a two-reel still film developing tank) into a water bath and raise the temperature to 50°C. Add the potassium bromide and stir or swirl continuously until both ingredients are dissolved	

The next steps must be conducted under a red or amber safelight, outdoors in the wilderness under a new moon, or in a light-proof container like a 35mm still film processing tank!

Solution B—mix separately under safelight or darkness:

Table 5.13 Solution B—Hand-Made Emulsion

Silver nitrate	10g
Distilled water	62.5ml
Dissolve the silver nitrate in the water by stirring or swirling, again, in a stainless steel container (a processing can for 35mm still film is ideal), and raise its temperature to 40°C in a water bath	

MIXING METHOD #1

This is the recommended method. It takes about an hour and a half, and, if you're careful with the temperature, yields a surprisingly fast emulsion with a high maximum density.

Stirring continuously, add half of solution B to solution A quickly. Continue stirring for one minute. Put on a water bath at 50°C, and let sit without stirring for 15 minutes. Keeping the temperature as close as you can to 50°C at all times is very important! If you get one piece of special equipment, get a temperature regulator for a water bath! Such a thing is made for "sous-vide" cooking (search for it on the internet) that turns any crock pot into just this; it's not required, and don't get it unless you want to do this again! Temperature has the single biggest effect on emulsion speed in a simple emulsion. Repeat the last two steps—stirring for a minute and letting it sit for 15—three more times, for a total time of about 60 minutes.

Add the other half of solution B in small amounts over 10 minutes, either by a steady drip, a slowly depressed syringe or about 1.5ml every 30 seconds stirring constantly. Keep the emulsion at 50°C as consistently as you can!

MIXING METHOD #2

This method is faster, but the emulsion produced is much slower. Add all of solution B to solution A in either a steady stream or in small, regular additions, stirring constantly. Keep the temperature at 50°C.

Either way, the emulsion is now finished and ready to use! Store it in a light-tight container—a daylight spool box works well. Make sure to label it so as not to open it accidentally in white light! To use, heat so that the gelatin melts—35°C might be a good starting point, but the consistency will depend on the temperature, and so this will be a matter of personal preference.

As to coating, it sticks well to cleared film that retains its commercially given gelatin coating (e.g. undeveloped fixed black and white print stock, or a finished black and white print that has been made clear by running through dichromate bleach or the equivalent), and seems to stick less well but maybe well enough to uncoated acetate, the clear leader you can buy in bulk. This will require some experimentation on your part. Coat on strips of a manageable length—say, about 4ft. A long continuous strip can be made by looping a strip of film back and forth on a flat surface, pinning or weighting down the corners where it changes direction, being careful to keep the gelatin side up. This will leave periodic spots where there is no emulsion. Or, if you have a way to wind up film with wet emulsion, you can coat a continuous strip of whatever length. Dry in total darkness, and be aware that it is light-sensitive film!

Expose generously—either outside in the sun if you're using it in a camera, or a flashlight seems to work well for contact printing. It will require some testing in either case to figure out what the right exposure should be, but, if you keep

the development time constant, this will be the only variable so this won't be hard.

I like to use a very soft brush that picks up a lot of emulsion, and to re-dip it frequently. Multiple coats are fine, and help build up enough thickness so that the maximum density of the final image is high. You have to beware, though, too much thickness, which can make the film impossible to fix completely. Bear in mind that this is art, not science! If you want regular results, use commercial film and send it to a lab, but don't send hand-coated film to a lab!

Develop in a standard developer and fixer. Use cold water for rinses, and make sure no solutions are over 20°C, otherwise the emulsion might come off. Colder is better! If you make the temperature colder, make the processing time longer (7 minutes @ 15°C). But be ready to remove the film from the developer if the emulsion starts to fall off!

Bear in mind that the wet emulsion is very fragile and scratches easily, and that it is susceptible to veiling, running and reticulation—all of which make working with hand-made emulsion exciting. You really should use a hypo-clearing agent at the end, as it is a silver image and will degrade if left contaminated with fixer, but the longer it's in any solution, the greater the risk of falling off, so use your own judgment. If you're just using it as an image source from which to print back onto regular film, this isn't an issue.

One developing method might be:

Table 5.14 Developing Method

Developer D-19	20°C	5 minutes
Rinse	<20°C	15 seconds
Any standard acid hardening or non-hardening fixer	~20°C	Until all milky areas are gone (or as gone as possible); ~2 minutes?
Rinse	<20°C	1 minute
Any hypo-clearing agent	20°C	2 minutes, if you dare!
Final rinse	<20°C	5 minutes, or as long as you're willing to risk it
Hang to dry		

Please let us know how you do (or if you have any questions) if you try any of this, either by email@handmadefilm.org on our research site! Happy emulsifying!

CHAPTER 6

In the Soup 2

Hand-processing color

INTRODUCTION

As I mentioned in the acknowledgements, the first time I hand-processed motion picture film was with Robin Cline at her house in the late 1980s in Olympia, Washington, using an E-6 kit to develop Ektachrome. I think it is funny that I basically did the most difficult process first (it had something like eleven steps) with absolutely zero idea about how toxic the chemistry was. I don't even remember what was on the film and the original is lost to time. Following that I began to experiment with black and white processing with kits designed for T-max still film. I hand-processed parts of *Story of Sarah* (1993), originally on Super-8mm, and was introduced to the joys of High-contrast black and white film by Michael Hoolboom. As I noted in the previous chapter, Hi-con was the cheapest, easiest-to-process stock and gave me the most interesting results. I was soon hooked on it and used it and various hand-processing techniques in my other 16mm films completed in graduate school, *Razed by Wolves* (1998) and *ENDLESS PRESENT: BIOGRAPHY OF AN UNKNOWN FILMMAKER, a film by Cornealius Thistle* (1999). *ENDLESS PRESENT* even foregrounded the act of hand-processing as part of the film.

Then I had a baby and got a doctorate in Anthropology. So my next films didn't come out until 2006. Both *fall* and *the passenger* featured hand-processed color negative. Lest you think that anthropology took me away from filmmaking, as a graduate student I was in charge of the visual anthropology lab and facilities that included a darkroom. I spent a decent part of my time while working on my dissertation hand-processing motion picture film in that lab. By the time I came to Emerson College as an assistant professor, hand-processing was a staple of my artistic arsenal and my tenure film, *Yanqui WALKER and the OPTICAL REVOLUTION* (2009), featured black and white and color negative and reversal film, all hand-processed. Although there are plenty of filmmakers who do this sort of thing it really hasn't been until recently that any of us spawned a second generation of hand-processers. In other words, most of the people I knew in the 1980s and 1990s who were hand-processing had sort of figured it out on their own. Then some of us became professors and began

teaching others, and some of those others went on to make this a central aspect of their work.

Outside of college, I first taught a hand-processing workshop through Scribe (www.scribe.org) in Philadelphia, Pennsylvania. It was held in somebody's basement and it was extremely fun. During the first few years I was teaching at Emerson, hand-processing was not a part of my pedagogy as I was trying to stay on the straight and narrow path towards tenure. But soon enough I was asked to teach something that required experimental processes and I jumped at the chance. It wasn't long before we were annoying the photo faculty and staff with film students invading the darkroom to process their film. There were some turf wars that probably should have been expected, particularly because some students are not so good at cleaning up after themselves, but, now that the photo faculty are less interested in silver processes and have a digital lab, the darkroom seems to be less of a contested domain.

My experience mirrors a trend. Internationally, since the late 1990s there has been a strong resurgence in artists dedicated to celluloid and willing to experiment with it materially in a variety of ways. At the same time commercial cinema has moved more and more towards digital acquisition and distribution. This has resulted in a considerable reorganization of the manufacturing and processing motion picture film industries. In March 2013 Fuji stopped producing all their camera stocks. Around the same time Kodak ceased producing their color reversal film stocks and many film labs, large and small, have gone out of business or stopped processing celluloid, such as New York's iconic DuArt laboratory did in 2010. The upshot is that smaller vendors are beginning to manufacture film stock for the boutique market of filmmakers, hobbyists and artists alike. The German company Agfa has begun to produce a color reversal film stock that can be purchased at Spectra Film and Video in North Hollywood and Dwayne's Photo in Parsons, Kansas, and repackaged as Wittner-Chrome by the German company Wittner-Kinotechnik. All companies can be ordered from online.

Meanwhile Kodak has rededicated itself to Super-8mm, albeit with only color negative and black and white stocks available, and continues to give a considerable student discount. And if you are not interested in processing your own color film, there are small labs (and more opening every day it seems) that cater to this growing niche of small-gauge filmmakers. And I am proud to say that several new organizations founded or co-founded by Emerson College graduates have popped up that are promoting experimental film production and curating and running workshops, such as Mono No Aware in Brooklyn, New York, and Balagan (co-run by an Emerson grad) in Cambridge, Massachusetts. It is my hope that the instructions given in this book will facilitate you starting your own cooperative or experimental film workshop or class.

The instructions in this chapter are meant for individuals who want to venture into color processing. But there is one caveat: color chemicals are often significantly more toxic than black and white. If you are unfamiliar with a

chemical or compound, look up its hazard warning on the web. In all cases I have tried to give you instructions that will help you either using kits OR mixing your own chemistry from scratch. Often the latter requires buying chemistry in powdered bulk and investing in a good scale and other photo-mixing supplies. In the long run you will save money by mixing your chemistry from scratch, but the cost outlay to begin can be prohibitive. This is why it's not a bad idea to go in on these purchases with like-minded friends.

ANATOMY OF COLOR FILM

Although different film stocks developed over the years differed in a variety of ways, the basic structure of color film stock, whether reversal or negative, is as follows: there are three layers of emulsion, with specific dye couplers interspersed with the silver halide crystals in each. Often there will be different-size "grains" in each layer to create a range of tonalities across that color. There is a filter made to take out yellow light between the first and second layer of emulsion. There are filters to cut out different spectrums of light in both color reversal and color negative film (Figure 6.1). When the film is put in the silver developer, each layer develops only those activated silver halide crystals, turning them into metallic silver. If the film is reversal, the metallic silver is removed and the unexposed areas are re-exposed either chemically or with physical re-exposure to light. This is similar to the process for black and white reversal, only there are three layers of latent images. Whether reversal or negative, the process of turning silver halide into metallic silver oxidizes the developer, which then combines with the color coupler to form the dye specific to that layer. Metallic silver is then removed by being changed back into silver halide by the bleach with the fix removing all silver halide crystals. What is left on the film are "dye clouds" where the metallic silver was: three layers of images that collectively replicate the color spectrum of the captured image—or its negative. And, over time, these dyes fade. That is why color film, reversal and negative, fades. If you skip the bleach (a.k.a. "bleach bypass") the metallic silver (blacks and grays) will remain, resulting in higher contrast, less saturation, blown-out highlights and loss of detail in the shadows in color negative. Skipping bleach will not make your film resist fading, although once it has faded you will be left with a more dense black and white image.

Color negative film also has a base that has an orange mask, whereas color reversal is on a clear acetate or polyester base. Both generally have an anti-halation backing that is black and can be removed by an alkaline pre-wash or in a final alkaline wash at the end of the process. This layer on the non-emulsion side of the film is called rem-jet backing. Composed of carbon black, this coating serves to improve the image by keeping light from bouncing around the film plane after it has already passed through the emulsion. However, if not removed before beginning color processing, it will tint your chemistry and, if not removed entirely during processing, it will create dark/opaque streaks on your color negative or reversal film. Although easy to remove, it is messy and often freaks out the novice processer.

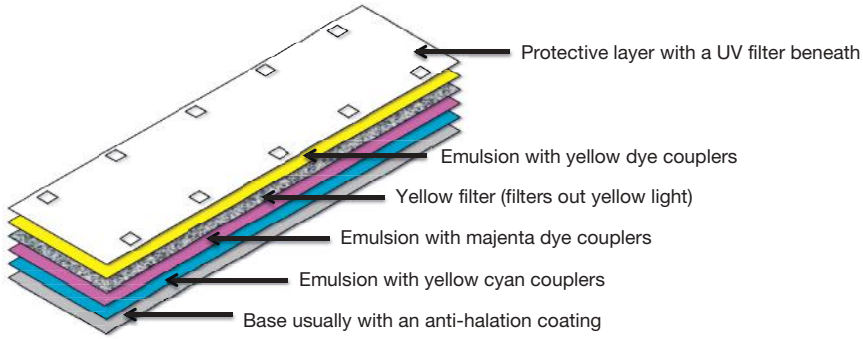
Protective layer with a UV filter beneath
Emulsion with yellow dye couplers
Yellow filter (filters out yellow light)
Emulsion with majenta dye couplers
Emulsion with yellow cyan couplers
Base usually with an anti-halation coating

FIGURE 6.1
Anatomy of color film. Although the specifics of color and reversal film vary across manufacturer and type, the basic elements are the same. All color film has three different layers of emulsion: yellow, magenta and cyan.

COLOR REVERSAL FILM

Back in the day, there used to be a great variety of color reversal films that were marketed towards hobbyists for personal filmmaking. There were daylight-balanced stocks and tungsten-balanced stocks, 8mm, Super-8mm, 16mm film. Often film was sold with processing included. Back when I began making films you could still buy Kodachrome (a proprietary color reversal stock and processing) in a variety of ASAs and send them in a special Kodak mailer to Europe for processing. Although Kodachrome had three layers of film, sensitive to three different light spectrums, the dye couplers were not a part of the layers of emulsion—allowing it to render a finer image and also giving it a significant (12-stop) range. However, this design required a very complicated processing technique, one that wasn't suited to home processing. The German film company Agfa began producing color film in the 1930s. Following World War II its United States-based subsidiary, Ansco, began producing a variety of color reversal film called Anscochrome. Fuji for a time also produced a color reversal film stock and Kodak began producing a faster (higher ASA) alternative to its Kodachrome stock called Ektachrome in 1977. Besides being able to shoot it with less light, because the dye couplers were suspended in the film itself (and not a part of the developing process), this film had the advantage of requiring a significantly simpler chemical processing.

Kodak made Ektachrome from 1977 until 2013. There was a flurry of panic amongst color reversal filmmakers in the Americas when Kodak announced it was discontinuing the stock. Almost immediately a German company called Wittner-Cinetec began taking Agfa color reversal film (Aviphot Chrome 200) and cutting and repackaging it as Super-8mm and 16mm film. At the time of this writing two retailers in North America are selling similar products. Spectra Film and Video has what it is calling Agfachrome in Super-8mm and 16mm and is selling it with processing and Dwayne's photo in Parsons, Kansas, is selling WittnerChrome in Super-8mm and 16mm. Another German company,

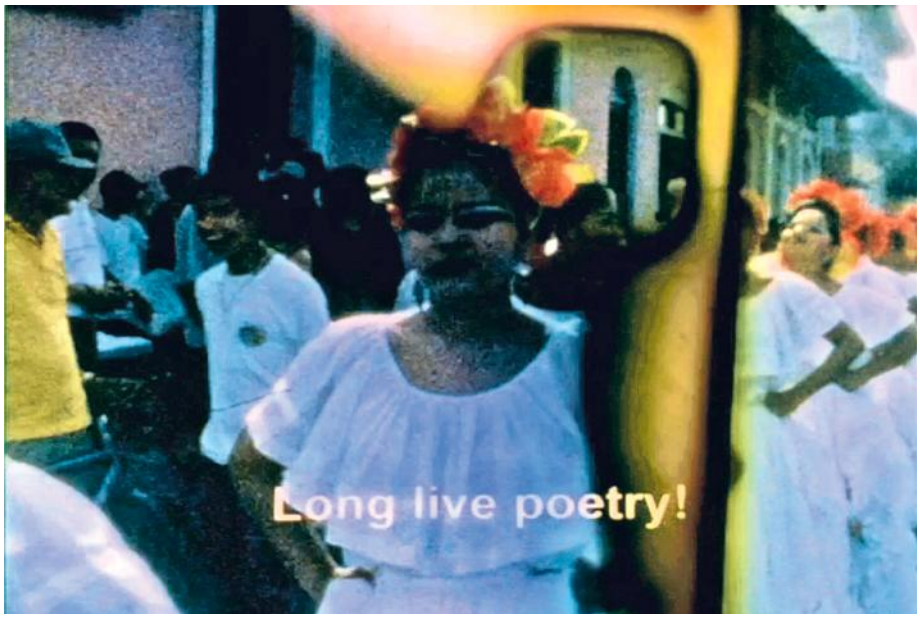

FIGURE 6.2
Hand-processed color reversal image with burned-in optical title. Film still from *Yanqui WALKER and the OPTICAL REVOLUTION*. Courtesy of the artist.

Kahl Film, is producing a 50ASA daylight color reversal stock available in 16mm, Super-8mm and 8mm. They also sell a Super-8mm kit with a developing tank, chemistry and reels. The films mentioned above are more expensive than the Ektachrome, Fujichrome, Kodachrome and Anscochrome of yore, but it would seem that small companies are reaching out to fill the void larger companies made when they stopped color reversal production.

BASIC COLOR REVERSAL PROCESS (E-6)

When I began writing this book, I used a kit manufactured by Tetenal for color reversal processing. Compared with my early experiments with color processing, it was fairly simple. There were three main steps, first developer, color developer and a combined bleach/fix with a pre-bath before (to swell the film and get it ready to accept the chemistry evenly) and a wash between each step. There was also a stabilizer included in the process that I would use if I wasn't moving directly to printing the film on my optical printer or transfer after developing. For a while this chemistry was unavailable in the United States and so I used the Kodak five-step E-6 process. "Five steps" is misleading as this process has nine steps (not including drying), six of them requiring mixing chemistry that you need to keep at a particular temperature. A number of home processers have stated that they prefer the Kodak because steps that are combined in the Tetenal kit are separate in Kodak E-6, allowing the filmmaker to tweak the

process with much greater accuracy. However, I was never hand-processing color reversal with the intention of replicating commercial lab results and so found the addition of steps annoying. There is also a three-step kit made by Arista that I have not used but which seems fairly similar to the Tetenal kit.

Each of these kits comes with mixing instructions and times (also available on the web). I won't detail the process here, except to give a few recommendations. Some of them are designed to be used with 35mm still film and this can be confusing for the motion picture film developer as instructions on mixing and exhaustion/replenishment (how long you can use the developer before you need to toss it away or add more chemicals to it) are explained in terms of number of rolls of 35mm film. Although it is not entirely precise, because 35mm film and 16mm film have differently sized sprocket holes, and some 16mm film has sprockets on both sides of the film, not just one, basically, one 36 exposure roll of 35mm still film has the same surface area as just slightly more than 10ft of 16mm film. Thus a single 100ft roll of 16mm film requires the same amount of chemistry to develop it as 10–36 exposure rolls of 35mm. Using this calculation, if one liter of Tetenal E-6 chemistry is sufficient to develop 12, 36 exposure rolls of 35mm, then it will certainly be sufficient to develop 100ft of 16mm or four rolls of Super-8mm film! Beyond that, the time and temperatures for the kits should be the same for developing either motion picture or slide film. Also, because they are designed for use with still film, which generally does not have a rem-jet backing, they do not contain a pre-bath or process to remove it. Therefore, a good first step (or last if you plan on dumping your chemistry and not reusing) would be to use the pre-bath compound listed with the homemade E-6 substitute below.

HOMEMADE E-6 SUBSTITUTE PROCESS

Assuming you have tried a kit or two (really, it is highly recommended doing this before you mix your own chemistry!) what follows are instructions on how to mix your own chemistry to develop color reversal films that require an E-6 process. Using this process will require the purchase of dry chemistry (see a list of vendors at the end of this chapter) and the addition of a very accurate scale (a small cooking scale that works from micrograms to 2 kilos is what I have) and multiple light-tight bottles and graduated cylinders, as well as a respirator to wear during the mixing process and chemical-resistant gloves. The process below is a substitute for the E-6 process using a tweak of the Kodak ECN color developer and some of the same chemistry as the black and white processes described in previous chapters. I gratefully acknowledge Robert Schaller (www.handmadefilm.org and interviewed at the end of Chapter 5) for his sharing of this information. He states: "I know that this is not 'correct', and no doubt the official way is better, but in this case the best is the enemy of the good. I leave it for you to decide!"

What you will need

- Accurate scale to measure chemistry. A kitchen scale is great, but don't use it for cooking after!
- Five containers for your chemistry.
- Graduated cylinders for measuring and mixing wet chemistry.
- Measuring implements for spooning out dry chemistry.
- Stirring implement.
- Darkroom sink or other deep sink or tub that you can refill with warm water to keep chemistry at temperature.
- National Institute for Occupational Safety and Health (NIOSH)-approved toxic dust respirator for measuring and mixing dry chemistry.

Please see each recipe for the ingredients for each particular step. The times/temperatures follow the recipes. Some of these compounds can be mixed up in advance, such as the pre-bath, the first developer, the stop and the fix (shelf life listed with each) and then brought up to temp for processing. Others, such as the color developer and the bleach, although they may have a shelf life of a week or so after mixing, require such precise temperatures, well above room temperature in most climates, that it's a good idea to mix them as needed.

Each dry chemistry should come with specifications for handling and disposal. If you have ANY QUESTIONS about this you should email or call the vendor and ask for Material Safety Data Sheets and follow the recommendations. You should mix the chemistry in a well-ventilated area, preferably with an exhaust fan and wear a toxic dust respirator, apron and chemical-resistant gloves when mixing. You should also wear the apron and gloves when processing. Make sure all your tanks, bottles, mixing containers and measuring implements are clean and the measuring implements dry. For each step of the process, measure out the ingredients and add them one at a time to the water, in the order listed, stirring to combine after each. DO NOT add dry ingredients together. Be sure to clean your implements between preparations so that you do not cross-contaminate. When you are ready to mix the temperature-sensitive compounds (color developer and bleach) fill a sink or tub large enough to fit all your jugs of chemistry with water slightly above the ideal temperature for those steps and place all your jugs into it once they are mixed. Before you begin processing, fill a second tub or sink that will fit your tank with water just above temperature to keep the chemistry at temperature while you are processing.

PRE-BATH

This is to remove the rem-jet backing—now this can be quite a trick to accomplish as it needs to be performed in total darkness. To be honest, I have frequently omitted this step and then put the film through a Borax bath at the very end of the process. There are a couple of downsides to doing this.

One, the carbon black comes off throughout the process and pretty much ruins all your chemistry. This is fine if you are using a one-shot kit but not fine if (as with the recipe here) you are making chemistry, some of which (like the souped-up D-19, the stop bath, the fixer) you'd like to use again (as it lasts up to eight weeks or more). Also, the rem-jet can come off and stick to the emulsion side of your film making it streaky or opaque. The best way to use this pre-bath is to submerge the film in it and then squeegee it off by passing it through your fingers (Schaller recommends without gloves) or by using a sponge on the non-emulsion side. Following that you can load up your film onto the Lomo spool or into a tank. If you're already working in buckets, there isn't much to fear by adding this step, but loading a Lomo with wet film is tough. Alternately, you could agitate your loaded Lomo reel in the pre-bath and keep rinsing it with water until it runs clear. Each of you will have to find a balance between your aesthetic taste and your patience. What follows is Schaller's recommended pre-bath taken from Kodak processes ECN-2 and ECP-2.

Table 6.1 Pre-bath to Remove Rem-jet Backing

Water 27–38°C (80–100°F)	800mL
Borax (decahydrate)—this is the Borax that can be found in the laundry detergent aisle at the grocery store!	20g
Sodium sulfate (anhydrous)	100g
Sodium hydroxide	1g
Water to make	1L

Note: pH at 77°F—9.25±0.10.

FIRST DEVELOPER

If pre-made, heat up to 37°C (98.6°F); 1L D-19 chemistry (either from pre-made mix or scratch—see recipe in Chapter 5). Mix in thiocyanate 2g/L.

STOP BATH

Any black and white stop bath (either from a pre-made mix or made from scratch).

COLOR DEVELOPER

SD-50 *Processing KODAK Color Print Films, Module 9, Process ECP-2D*. To make 1L—1L is sufficient to process 100ft of 16mm in a Lomo tank. It is possible to make replenisher (see *Processing KODAK Color Print Films, Module 9, Process ECP-2D*) if you will be processing additional rolls within a short period of time. The color developer and replenisher have a shelf life of one week so it is not advisable to make more than you will need to use within that time.

Table 6.2 Kodak SC-50 Color Developer	
Water 24–38°C (75–100°F)	900mL
Kodak anti-calcium, No. 4	1.0mL
Sodium sulfite (anhydrous)	4.35g
Kodak color developing agent CD-2	2.95g
Sodium carbonate (anhydrous)	17.1g
Sodium bromide (anhydrous)	17.2g
Sodium hydroxide	None
Sulfuric acid (7.0N)	.62ml
Water to make	1000mL

Note: pH at 25°C (77°F) should be 10.59±0.05.

FERRICYANIDE BLEACH

SR-27 *Processing KODAK Color Print Films, Module 9, Process ECP-2D*. This is to make 1L, which is sufficient to process 100ft of 16mm in a Lomo tank. It is possible to make replenisher (see *Processing KODAK Color Print Films, Module 9, Process ECP-2D*) if you will be processing additional rolls within a short period of time. The bleach and replenisher have a shelf life of one week so it is not advisable to make more than you will need to use within that time.

Table 6.3 Kodak SR-7 Ferricyanide Bleach	
Water 32–43°C (90–100°F)	900mL
Potassium ferricyanide (anhydrous)	30g
Sodium bromide (anhydrous)	17g
Water to make	1000mL

Note: pH neutral—6.5±0.5 at 25°C (77°F).

FIX

Non-acid/non-hardening.

Table 6.4 Fix	
Water at 27°FC (80°F)	900ml
Sodium thiosulfate anhydrous	160g
Sodium sulfite anhydrous	30g
Water to make	1L

Note: check your pH. You may need to add some Borax as a buffering agent to get it to a neutral (6.5).

The process

Use the standard black and white reversal developer as the first developer, and ECP chemistry for the rest. This saves mixing extra chemicals, and makes it so that you can use the same set of chemicals for both reversal and positive prints, which is very handy if you do both. I know that this is not "correct", and no doubt the official way is better, but in this case the best is the enemy of the good. I leave it for you to decide! Meanwhile, it boils down to this:

Table 6.5 Substitute E-6 Process by Robert Schaller

In total darkness!!!		
0.	Pre-bath—room temperature (70–80°F)—see instructions with the recipe	
1.	D-19 with thiocyanate (2g/L)	6 min @ 37°C
2.	ECP-2 stop bath (Kodak SB-14), or any black and white stop bath—mix up a SEPARATE solution used only as a black and white stop bath	1 min
In normal room light		
3.	Re-exposure—passing the film end-to-end 6 inches from a 500W bulb seems adequate. At this point you should check your film and see if the rem-jet is gone. If not you can, in room light, gently scrub the non-emulsion side with a soft toothbrush or cloth while running under running water. If you are using a Lomo tank, do not unspool it just to clean it! You can simply expose the film to light now and clean it with another alkaline wash at the end as you unspool it	n/a
4.	ECP-2 developer (Kodak SD-50)	3 min @ 36.7°C
5.	Water rinse	1 min
6.	Ferricyanide bleach (Kodak SR-27)—the temperature is important, or it won't work!	5 min @37°C
7.	Water rinse—a thorough rinse is important here!	1+ min
8.	Fixer (Kodak F-35c or equivalent: must be a non-acid, non-hardening fixer!)	3–5 min
9.	Water rinse—several changes. Now is a good time to get the final bits of rem-jet backing off the film! You don't want it to dry there. It's not a bad idea to use perma wash at this point as it will help clean up the film and aid in drying	5 min

Note: the specified temperatures are essential! The first developer time can be adjusted with temperature, but the color has to be as specified! Temperatures not specified are not critical; ideally, use something around 20°C or warmer (but not hot).

BASIC COLOR NEGATIVE PROCESS (C-41)

The easiest way to develop color negative film is with a C-41 kit. At the time of this writing, Tetenal and Unicolor both make 1L home process kits that are very simple to mix and use. Tetenal also has a 5L kit. I recommend about 1L of chemistry per 100ft of 16mm although I have used the same kit over again, extending the time of each step and gotten pretty good results. What is great about the kits is that they are a three-step process, developer, blix (a bleach + fix compound) and stabilizer. The latter is very important to keep your film from fading. It contains formaldehyde (as does most nail polish, but for some reason THAT is not a controlled substance) so keep it off your skin. The kits come with times and temperature recommendations but are made for still film that does not have the rem-jet backing. Thus I recommend using the pre-bath listed above in the E-6 substitute process to remove the rem-jet before processing.

It is also possible to brew up your own C-41 chemistry or follow Kodak's recipes for ECN-2 process as outlined in Kodak Publication No. H-24.07,

FIGURE 6.3
Film still from *Yanqui WALKER and the OPTICAL REVOLUTON*, color negative hand-processed film. Courtesy of the filmmaker.

Processing Kodak Color Negative Motion Picture Films, Module 7 (www.kodak.com/go/h24). If you are going to experiment with the substitute E-6 process above, you can easily mix up enough stop bath, bleach and fix to use for both processes. However, once you use if for one, do not cross-contaminate. Please see Robert Schaller's instructions in this regard (https://filmprocessing.wordpress.com/final-recipes/) as he has really thought through tweaks to both processes for the home processer. The C-41 recipe is as follows:

C-41 from scratch

Use the pre-bath from the E-6 recipe above.

DEVELOPER

Table 6.6 C-41 Developer

Water 24–38°C (75–100°F)	900mL
Sodium hexametaphosphate	2g
Potassium carbonate	34g
Sodium bicarbonate (baking soda)	1.9g
Sodium sulfite	3.5g
Potassium bromide	1.4g
Potassium iodide	1.4mg or 1.4mL of solution below*
Hydroxylamine sulfate	2g
Color developer 4 (CD-4)	5.3g
Water to make	1L

Note: pH of 10.16 at 25°C.

*Most home processors will not be able to measure 1.4mg. So the solution is to dissolve 1mg of potassium iodide in distilled water to create a solution. Then measure (a medicine syringe is good for this) 1.4ml of the solution. Voila!

C-41 STOP BATH

Table 6.7 C-41 Stop Bath

Glacial acetic acid	10ml
Water to make	1L

C-41 BLIX

Table 6.8 C-41 Blix

Water (room temperature or 72°F)	500mL
Ammonium thiosulfate 60 percent	200mL
Ferric ammonium EDTA	25g
Sodium sulfite	15g
Potassium iodide	1g
Acetic acid 28 percent	10mL
Water to make	1L

C-41 STABILIZER

Table 6.9 C-41 Stabilizer

Water (room temperature or 72°F)	800mL
Formaldehyde 37 percent	3mL
Photo-Flo 200	0.8mL
Water to make	1L

Process

All chemistry (and film) MUST BE at 100°F/38°C. The best way to do this is fill a sink or tub (which can fit all the chemistry bottles) with warm water until the chemistry is up to temperature. Then fill another sink or tub that can fit

Table 6.10 C-41 Temperatures and Times

Pre-bath 100°F/38°C— to remove rem-jet	5 minutes in bath, then rinse until water runs clear OR use Schaller process
Developer	3:15
Stop bath	0:45
Rinse (two changes of water)	1:00
Blix	6:30
Wash (several changes of water)	4:00
Stabilizer	1:00

the processing tank with warm 100°F/38°C water. Except when you are emptying chemistry out of the tank, the tank should stay in this warm bath to maintain temperature consistency. I know of many home developers who have not paid as much attention to temperature and this leads to color shifts and can (in the case of the color developer) lead to uneven development. So try to keep it at temperature.

The film will appear cloudy after the stabilizer, but will clear up as it dries.

LAST THOUGHTS FOR NOW

Developing color film is not for the faint of heart and requires a kind of precision and commitment that only a few home processers will really have. It is easy to experiment with premixed kits and I highly recommend this as a starting point as it will get you familiar with the steps and what works in your home lab. At the time of writing, they were still available for E-6 and C-41 processes. The recipes are included here in the event that kits become unavailable or you are ready to move beyond what a kit can provide. But please, don't dump your chemistry; take it to the appropriate hazardous waste facility. And please be very careful to follow the material safety sheets for any kit or chemical you handle. You only have this one body, so be kind to it!

As I may have mentioned somewhere in this book, I've been teaching students how to process film for some time. In fact, the particular class that this text springs from, Alternative Production Techniques, has been responsible for leading more than one student away from the industrial/commercial path towards the life of an artist and/or experimental filmmaker. One such alum, Sean Hanley, became part of a collaborative in Brooklyn called Mono No Aware and it was through him that I met the artist I am interviewing for this chapter, Josh Lewis. Josh used to work in a film lab and this is how he came to his artistic practice. As such he brings the precision and insight of a scientist or engineer to his filmic experimentation.

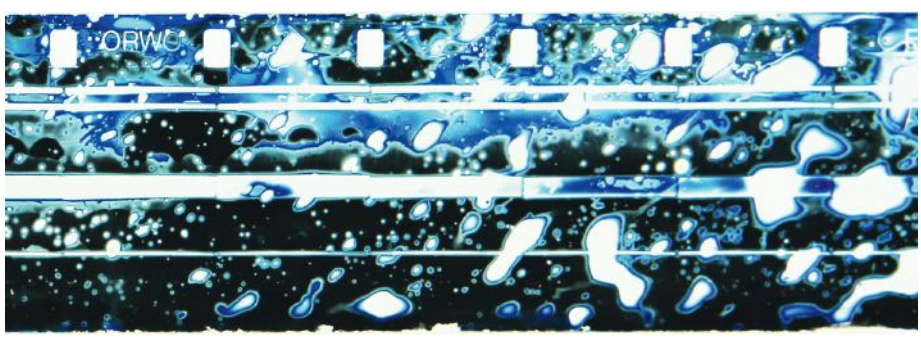

FIGURE 6.4
Doubt by Josh Lewis. Courtesy of the artist.

INTERVIEW WITH JOSH LEWIS

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a new media practitioner, a shaman, a performer? How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

Josh Lewis: It depends on who I'm speaking with, but I usually go with either artist, filmmaker or experimental filmmaker depending on which term I feel like will register easiest with the other person. For myself personally, I don't feel any particular allegiances to any term, they're all fine.

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

JL: After school, I took a job at a photochemical film-processing lab. We did 16mm and Super-8 reversal film. I studied art history in school and had made little movies with a video camera before, but I hadn't had any real contact with proper filmmaking or film school, so my first real introduction to film was just as this kind of malleable, reactive material that we were subjecting to these various chemical baths. From working at the lab I got a basic understanding of what each chemical did (developer turned exposed parts of the film black,

FIGURE 6.5
Josh Lewis's home film lab.

bleach removed the black, fixer turned things clear, etc.), eventually I started filling up a plastic cup with developer or bleach here and there from the machines and then applying them onto scraps of film to see what happened. From the beginning it was really just about trying to figure things out manually and through observation, and I think that's where I'm still at. I've gotten more into the chemistry of it as I've progressed, but I think its important that things remain somewhat mysterious, otherwise I think there's a risk of losing the art. Right now, the possibilities for working with chemicals, light and emulsion feels totally open and limitless.

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools/and what your work is about? Is your work about something(s)?

JL: I set up my own studio and darkroom about three years ago, and I had to spend some time figuring out my own set-up and had to learn how to work without industrial equipment. So most of my tools for working with film I built myself. The emphasis of these tools is about being able to access and apply chemistry to specific parts of a roll of film and to avoid just putting the film in a bath. Although I did acquire a contact printer recently, and that's opened up some interesting possibilities in terms of using it for purposes it wasn't necessarily intended for. Much of my work is completely abstract at this point—in terms of what it's "about", I'd say its pretty process oriented, the

FIGURE 6.6
Josh Lewis hand-painting developer in red light.

darkroom has become a kind of sanctified space in which I'm really forced to reckon with myself and this material I've chosen to work with that just seems relentlessly to have a mind of its own. It's really about the struggle to control outcomes, having to accept that that kind of control is really impossible, and the beauty (or horror) that comes out of putting yourself into this situation.

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

JL: Mostly I've shown at experimental film festivals and small venues/galleries that lean towards this kind of work. I generally think that the intimate "black box" style venues are adequate spaces to experience this kind of work, and I make the work knowing that this is where they're probably headed. There's certainly a value in having to sit through a film from beginning to end, to submit to the experience. As much as I think the communal aspect of cinema is important, I do have a fantasy about showing my films in a small room with just one person and a projector. My process is necessarily very isolated and done in confined spaces, and I think there might be a natural way of maintaining that if I could make a single viewer experience one film completely on their own. When you're with others it's easy to drift, and wonder what everyone else is thinking about the film; when you're by yourself you might give in to the experience a little easier.

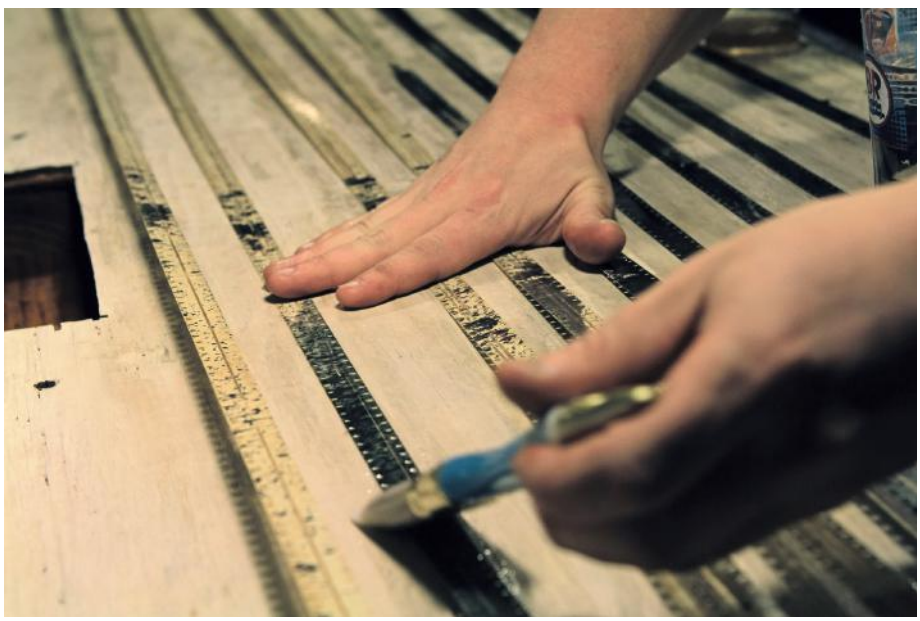

FIGURE 6.7
Josh Lewis applying the fix.

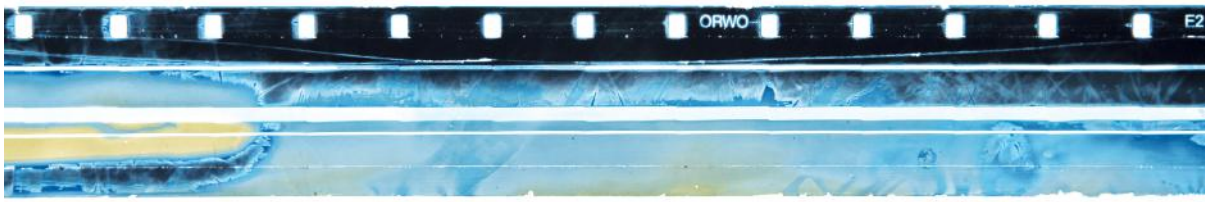

FIGURE 6.8
Josh Lewis still frame from *Doubt*. Courtesy of the artist.

KR: And finally, your chapter is called "In the Soup 2: Hand-Processing Color". Please elaborate how you came to such an activity? Are you part of a community of makers (either locally or internationally) who communicate with each other about their work and get together either virtually or physically to discuss/show/celebrate? Where? When? How? What happens?

JL: See above re. how I came to the activity of hand-processing. I work and teach with Mono No Aware in Brooklyn and this is an extremely important network of makers for me personally and creatively. Mono offers workshops on many different aspects of analog filmmaking, but I'm mostly involved with the wet lab-related workshops (hand-processing, alternative processes, hand-made emulsion, etc.), which I teach out of my own lab. What's nice about Mono is how many of the people stick around after workshops. A lot of people take what they've learned and get deeper and deeper pursuing their own channels and practices with the medium, and then just end up becoming friends and colleagues. I try to make my darkroom as open as possible to former workshop participants and others who want to use it, so the space has become a pretty active place for people looking to pursue experiments in photochemical work. It's nice that you get immediate gratification from hand-processing; we can screen each other's rolls right after they dry and talk about what happened. We push each other.

Another important network is www.filmlabs.org, which is a network of artist-run film labs, many of which are in Europe, but increasingly there are more and more initiatives happening in North America too. Having other lab people to talk to and consult with is extremely important in terms of exchanging information.

Josh's developer

Here's a recipe for a very alkaline paint-on developer:

- Start with 200g water.
- 8g metol.
- 10g sodium sulfite.
- 20g sodium carbonate.
- Add to 300mL water.

Use between 75–80°F. If you use this in the dark, this developer is aggressive enough so that you can apply small amounts of it directly to the film with a brush or whatever kind of tool you like and the image will develop up.

Fix, wash and dry as normal with black and white chemistry.

Filmlabs.org

In 2005 there was a meeting of independent/artist-run labs in Brussels. Following this meeting there was an initiative by the members of Cinema Nova and other film labs in the network that led to further meetings and the building of the website. Please go to the website for historical overviews, further technical information, recent works by members and more. They say:

> Artist-run film labs implement an original way of using production tools, through their collective organizations, for filmmakers and artists currently working with celluloid film. They act as an experimental ground for cinema (beyond any genre) at a time when the industry is gradually getting rid of film and, with that, the means to process and print.
>
> **www.filmlabs.org/index.php/site/home**

On the website there are thirty-two artist-run labs throughout the Americas, Africa, Asia and Europe. In December of 2012 I was privileged to visit two of these labs in the Paris region, L'Etna in the Marais neighborhood of Paris and L'Abominable in a suburb. L'Abominable runs both black and white and color negative and reversal on a weekly basis. They host classes to train new members on the equipment and then members either pay a fee to have the member/workers print their film or print it themselves. The member/workers do all of the processing at the lab. Below are a few images from our visit.

FIGURE 6.9
The chemical mixing bench at L'Abominable.

FIGURE 6.10
100ft Lomo reels dry in a dish rack.

FIGURE 6.11
A film fryer made out of a salad spinner at L'Abominable.

FIGURE 6.12
The processing machine.

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Kodak Essential Reference Guide. Eastman Kodak, 2007. Available free online at http://motion.kodak.com/motion/uploadedFiles/Kodak/motion/Education/Publications/Essential_Reference_Guide/kodak_essential_reference_guide.pdf [accessed January 9, 2015].

Processing Kodak Color Print Films, Module 9, Process ECP-2D. Eastman Kodak, 2009. http://motion.kodak.com/motion/uploadedFiles/h2409a(1).pdf [accessed January 9, 2015].

Vendors

ArtCraft Chemicals, Inc. PO Box 382, Altamont, NY 12009, (800)682–1730, www.artcraftchemicals.com/products/.

B & H Photo Video (superstore). 420 9th Ave at 34th Street, NY, NY 10001, (800)606.6969, www.bhphotovideo.com/.

Photographer's Formulary Inc. PO Box 950/7079 Hwy 83 N Condon MT 59826, 800–922–5255, http://stores.photoformulary.com/index.php.

CHAPTER 7

In the Soup 3

Eco hand-processing

The title of this chapter may be a bit misleading. Film developing is never completely environmentally friendly, but you can minimize the risk to yourself and the environment significantly by processing your film with the recipes contained in this chapter. While all silver process films (color, black and white, reversal, negative) *can* be processed with the recipes in this chapter, the resulting image will be a black and white negative image, usually with a distinct brown cast to the film (although this can be removed). The processes this chapter discusses has been dubbed caffenol by the people who use it, most of whom are still photographers and comes (so far as I can assess) from a merging of the terms caffeic acid and phenol (more about these in a minute). There is a caffenol Facebook group, Flickr group, several websites and blogs, and even an online book, *The Caffenol Bible*, devoted to it. In the last decade or so a handful of intrepid filmmakers began to experiment with developing motion picture film with these homebrew processes. The results were amazing and seriously less toxic than using traditional developer.

So what is *caffenol*? It is a term coined by photographers over the past decade or so, who began using a developer made from coffee and a couple of other basic ingredients to process black and white film. As different folks experimented with different film stocks they began to tweak the recipe and variations were created such as *caffenol C*, which was the original recipe with vitamin C added, or *caffenol LC*, a variation meant to provide low-contrast images. A man named Donald Quall claims to have invented the term *caffenol* and the first usage of the term on the web that I was able to find was from 2006 and does point back to Donald Quall. Beyond that, attribution for the *term* is a little hazy, but there is ample evidence of experimentation with using coffee as a developer preceding the origination of the term.

Online investigation via the Facebook group (of which I am a member) has led to some claiming that coffee was used during World War II when traditional photochemistry was scarce as well as pre-World War II manuals listing "camp coffee" and urine as possible options for developing photographs. Most folks who use a coffee developer point to Dr Scott Williams and a publication of

his and his students' findings in their 1995 class *Technical Photographic Chemistry* at the Rochester Institute of Technology (RIT), in the September/October 1995 issue of *Darkroom & Creative Camera Techniques*. The class was tasked with finding common household substances that would work to develop film. The starting point was to ascertain the chemical composition of common photo developing agents and then find common ingredients with similar chemical make-ups. The class began with soaps, hydrogen peroxide and ascorbic acid, and then moved on to coffee and tea. Coffee yielded the best results and so the students worked to find a preparation of coffee with other common ingredients that would improve results.

As you will know from previous chapters, film is composed of silver halide and a developing agent needs to be reactive to silver. Silver is ionized when it is exposed to light. A developing agent needs to oxidize (turn black) the activated silver particles. Phenols, present in high concentrations in a variety of plants and also in wine, are also the primary component of film developers. Thus, when Dr Williams was looking for an everyday alternative to developing chemistry, his students began with items that were high in phenols.

Another aspect of successful developing chemistry is the pH of the mixture. The silver halide crystals are suspended in a gelatin or resin, which requires a base pH compound to swell in order for the developing agent to get at the silver. The higher (more base) this pH, the faster the gelatin will swell and the faster the film will develop. If the chemistry is too base, however, the process can happen too fast or be very uneven. Coffee is acidic, and every silver-ion to silver-atom conversion generates both acid and base, so Dr Williams's students looked for something to "buffer" (raise the pH/make more alkaline and maintain that pH) the compound and hit upon sodium bicarbonate (baking soda) and potassium hydroxide (a drain cleaner). In their experiments, they found that a solution of pH 9 at 85°F for 25 minutes was most successful in developing Kodak Tri-X Pan (400ASA) still film and they used a similar agent for developing the print on resin-coated (RC) paper. The class used D-76 as a control, developing the same photo in both traditional and coffee processes. In a recent email to me, Dr Williams admitted that a developer made using mint worked even better than the coffee, but they decided to share the results of the coffee process as they had the most research on that.

Their coffee process, for use on Kodak Tri-X Pan (400ASA) film, was published as follows:

- Instant (caffeinated) coffee: two rounded teaspoons.
- Baking soda (sodium bicarbonate): two rounded teaspoons.
- Potassium hydroxide (added to achieve pH 9): one rounded teaspoon.
- Water: 12oz.
- Temperature: 85°F.
- Time: 25 minutes.
- Fix and wash as normal.

No matter what the origins of the "caffenol" process, it provides a really great option for filmmakers working in black and white to experiment with a non-toxic process. The developer can go down the drain as no silver has leached into it, but the fixer (more about this after the caffenol recipe) must still be disposed of properly as it contains silver, which is harmful to man and beast when it gets in the water supply. And like all photo processes, in order to make sure your negative remains in good condition, it is necessary to really rinse the film with several changes of water for at least 20 minutes. This wastes water, a resource that we increasingly need to think of as finite. So these are problems that environmentally minded artists need to think through. (Digital processes are just as environmentally hazardous, although we outsource much of that hazard to China and other countries for manufacture and disposal, and thus are somehow blind to the extraordinary environmental cost of obsolete digital technology.)

Hand-processing with caffenol requires much the same tools as any other hand-processing technique. If you haven't read it already, please review the hand-processing section of Chapter 5 to determine your developing strategy (e.g. using a Lomo tank, jamming the film in a can, etc.). The chemistry works well at slightly above room temperature but isn't terribly temperature sensitive, so a warm bath with tap water should be fine. The process does take a bit longer than other black and white chemistry, so using a Morse tank (reel to reel) does not make sense. Some people use volumetric measurement (e.g. teaspoons, tablespoons, etc.) to dish out the chemistry and others insist on weight. Strongly recommended are pH strips that can measure the full range (1–13) as is a straining device, especially when using grass, leaves and other plant material. However, you'll find folks who embrace the chunks of organic material deposited during the process as desirable. Like most hand-processing techniques, if you want a lab look, this isn't for you. What follows is a recommended list of materials in addition to those recommended in Chapter 5 for hand-processing.

What you will need

- A small scale that does precise measurements from grams to a kilo or so OR measuring spoons.
- pH strips.
- Something to strain your mix if using garden materials.
- Soda ash, a.k.a. washing soda, a.k.a. sodium carbonate. This can be found at pool supply stores—it is used to adjust pH in pools—AND at art supply stores that have a good fabric dyeing section. Outside of the United States this can be found in the laundry soap section.
- Vitamin C crystals (NOT pills but crystals without any additives—you may need to order this online).
- Potassium bromide OR iodized table salt.
- Instant coffee (not decaf).

CAFFENOL RECIPES

So after photographers got the idea that film could be processed in coffee, recipes proliferated on the web. It was generally agreed (though I'm not exactly sure why) to substitute vitamin C crystals (ascorbic acid) for the acid buffer in the RIT recipe and washing soda or sodium carbonate for the alkaline. As I noted earlier, the etymology of the term caffenol is difficult to decipher, but around the early 2000s more web searches and posts for the term began to appear. If you Google it right now you can find dozens of sites with caffenol recipes tweaked for specific film stocks. Because I am mostly interested in motion picture film, I will give you the recipes that work best for black and white film stocks. The recipe below was arrived at with advice from the online Facebook group and is titled caffenol C (for vitamin C) M (for medium speed film) and is good for 50–200ASA. A word of caution: most caffenol developers don't have a great shelf life when mixed so mix only as much as you need for the film you are developing at that time.

Caffenol-C-M

This is an alternative, non-toxic black and white developer that produces a black and white negative image and can be used on any type of medium-speed film, even color (the results will be black and white). To 1L of water at room temperature (72°F) mix in the following ingredients, stirring thoroughly after each until dissolved.

- 54g sodium carbonate (anhydrous).
- 16g powered vitamin C.
- 40g instant coffee.

Table 7.1 Estimates for Stocks in Caffenol-C-M

	ORWO U54	Kodak Tri-X
Pre-bath—water	5 minutes/72°F	5 minutes/72°F
Developer	15 minutes/72°F	20 minutes/72°F
Rinse/stop bath	Two changes of water	Two changes of water
Fix (any rapid fixer will work—use a non-hardening variety if you hope to tone the negative after)	4 minutes/72°F	4 minutes/72°F
Wash	Several changes of water	Several changes of water
Dry	20–40 minutes	20–40 minutes

Just like any developer, if you increase the temperature you can decrease the time of development. Below are some estimates for various stocks in this developer.

If you find that your results are too dense or fogged, you might try adding some restrainer to the mix. Potassium bromide (1.2g/L) gives the best results but ordinary iodized table salt (10g/L to start) can also be used.

FIGURE 7.1
My first experiments with a non-coffee caffeic acid compound. I used lawn cuttings a.k.a. "grassenol". These are frames of that film in their negative form.

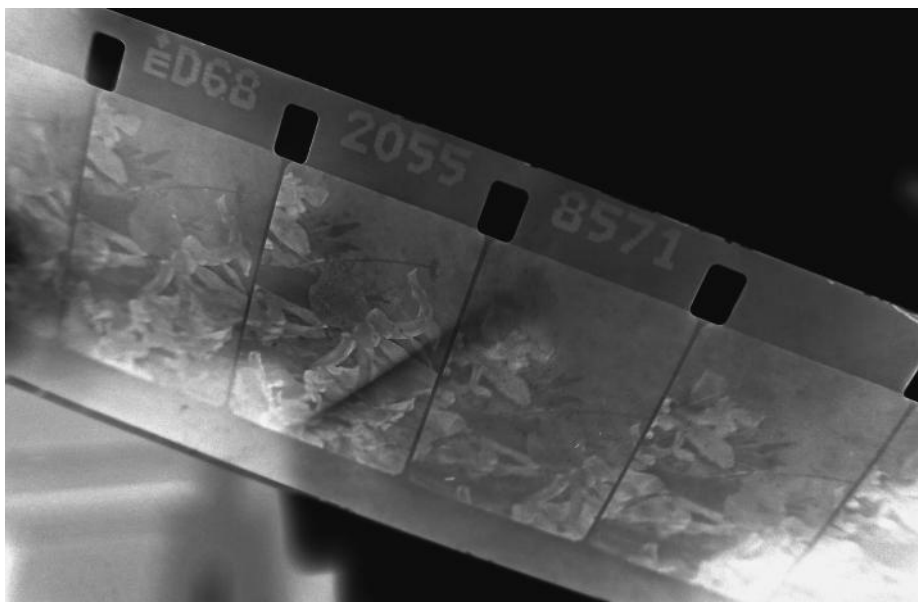

FIGURE 7.2
My first experiments with a non-coffee caffeic acid compound. I used lawn cuttings a.k.a. "grassenol". This is what the frames look like digitally inverted to a positive image.

GRASSENOL

My first experiments with a non-coffee-based developer used grass from my freshly cut lawn. My initial experiments were completely overdeveloped so I posted my recipe and results on the Facebook caffenol page and got some extremely useful feedback. I thought I might need a restrainer, but it was recommended that I first try modifying the pH to be in the 9/9.5 range (see Figure 7.3). I am delighted to say that the following recipe was extremely successful.

FIGURE 7.3
Using pH strips purchased online I was able to adjust the developer to a 9/9.5 level. This is essential for proper development.

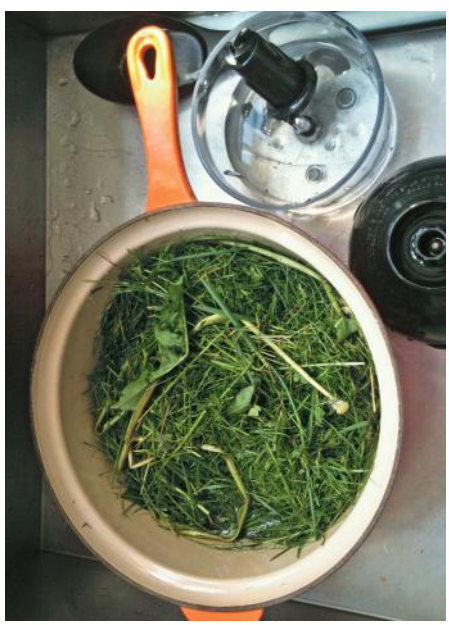

FIGURE 7.4
(*Left*) Stewing the grass.

FIGURE 7.5
(*Right*) Straining the grass juice.

1. Stewed a 2 quart pot of grass clippings and water for 2 hours (see Figure 7.4) (other users had simply set the clippings in the sun with water for a couple of days—grass sun tea—but reported serious stink from this process). Being pregnant at the time I wanted to reduce the possibility of nausea-inducing smells.
2. Strained the "grass tea" with a fine-mesh kitchen strainer and then a photo funnel with a fine-mesh strainer (see Figure 7.5).
3. Cooled the "tea" to 30°C.
4. Added 50g washing soda (sodium carbonate)—stir to mix!
5. Added 10g vitamin C crystals—stir to mix! (this was arrived at by testing the pH and adding Vitamin C until I got a pH of 9).
6. Used immediately for 10 minutes (at about 28°C/82°F) to develop Kodak Tri-X (200ASA daylight) as negative.
7. Fixed with Kodak rapid fixer for 4 minutes.
8. Washed with several water changes for 20 minutes.
9. Dried in the sun.

FIGURE 7.6
Dagie Brundert with her Nizo Super-8mm camera and a cup of coffee. Photo courtesy of the artist.

As you can tell from the process, I developed at a higher temperature than the previous caffenol recipe. This allowed me to shorten the developing time to 10 minutes. Just like with any developer, with caffenol processes, the hotter the chemistry the faster the developing time and vice versa. Faster times will also increase the contrast. My interest in using grass was that I happened to have a lot of cut grass lying around after mowing the lawn. Filmmaker Dagie Brundert has tried all kinds of organic materials that contain phenols, including beer, wine, potatoes and seaweed, among others. Wherever she travels she looks for local plants to work with. Below are her potato and wine recipes. An interview with her is at the end of this chapter.

KARTOFFEL—POTATO CAFFENOL

What you will need

- 1L pressed potato juice (you need a juicer for this).
- 20g vitamin C.
- 10g soda.

FIGURE 7.7
Dagie preparing kartoffel (potato developer). Photo courtesy of the artist.

The process

- Develop at 28°C for 20 minutes.
- Fix 4–5 minutes in fixer of your choice.
- Wash 10–20 minutes, changing water every minute or so.
- Dry.

You can see a film made with this process at http://vimeo.com/65772992.

WINENOL—WINE CAFFENOL

There are many recipes for this on the web that I have tried. I have also tried a variety of wines, all of them leftovers or very bad (like two buck chuck in the United States that actually costs two USD for 750ml of red wine) and found no variation in the functionality of the developer. Wine (even from Trader Joe's) is not as cheap as instant coffee, so I recommend setting out a pot at your next party where folks can drain their wine glasses if they don't intend to finish them and saving up the dregs. Beer and other alcohols can also work as a developer and so I recommend experimentation (see Figure 7.8). As with all the recipes in this chapter, this one is based on making 1L of developer for processing 100ft in a Lomo tank. Halve it if you are developing Super-8 in a Lomo tank or double it for bucket processing.

WHAT YOU WILL NEED

- 1L of red wine.
- 100g of washing soda.
- 25g of vitamin C.
- Something to mix up your concoction in.

The process

1. Warm the wine a little if it has been kept cool—you want your wine at room temperature/72°F—so warm it in a water bath or just set it out until it has warmed to room temperature.
2. Stir in the washing soda/soda ash.
3. Stir in the vitamin C.
4. Develop your film for 25–30 minutes. If you want to shorten the process to 20 minutes you can raise the temperature of the developer to 80°F. I do recommend having a few snip tests that you take out during the process, quickly rinse and then dunk in fixer to see about adequate developing if you are experimenting with times and temperatures.
5. Wash with two changes of water.
6. Fix normally

7. Wash for 10–20 minutes.*
8. Hang to dry.

*You may get a nice rosy staining on your film that will invert to its opposite if you transfer the film and change it from negative to positive. If you don't like this, simply wash with perma wash or hypo clear about half way through your final washes.

FIGURE 7.8
Dagie's "Tullamol" recipe made with Tullamore Dew whiskey. The recipe is for 500ml—the amount to process 1 roll of Super-8mm in a Lomo. Photo courtesy of the artist.

SALT FIXER

Fixer, as you already know, removes the undeveloped silver halide from the negative. This is important because if the silver remains it will eventually darken and ruin the image. It is very simple to make fixer from either a powdered mix or liquid. It is also relatively inexpensive and, with black and white processing, lasts for a very long time. It is also possible to make fixer from scratch, but this seems like more trouble than it is worth and generally ends up costing more as you have to buy minimum amounts of the various chemicals that are used. The most important thing to remember is that, if you are going to tone your film after you develop it, you don't use a hardening fixer. If you are not, use a hardening fixer as it will help preserve your film from scratches. Most black and white fixers out there aren't terribly toxic, at least until you've used them. Then they have metallic silver in them, which, as I've said, must be disposed of properly. I also prefer to use an odorless fixer. But folks have really wanted to take their "household" processing all the way, so the following is a recipe for a fixer using ordinary table salt!

What you will need

- A heat source and a pot you can make up your salt solution in.
- A liter + of water at room temperature.
- Something to stir your salt with as it is dissolving (takes some time).
- 300g of salt! (That is roughly 1 cup + a scant tablespoon of salt.)
- 1L or larger measuring cup/graduated cylinder/glass bottle you've recycled and marked where 1L is.

The process

1. Heat the water to boiling and then turn down to a simmer.
2. Add the salt a little at a time, stirring until dissolved.
3. Pour into your measuring implement and add cool water until your solution is at 1L.
4. You are looking for a working temperature of 30°C/86°F and it will take 2 hours or more to fix the film, so either keep the tank warm in a bath or if it is sunny put it outside.
5. If you want to experiment with times/temperatures, take an undeveloped piece of the kind of film you are using and put it in the fixer bath. Leave it in for at least an hour and then remove it every 15 minutes to see if it is clear. Once it is clear, double the amount of time it took and that is your fixing time.
6. Use perma wash or hypo clear or a little bit of dish soap to make sure you get all the salt off, unless you want salt formations on your film, which, come to think of it, look pretty cool.

DISPOSING OF SPENT FIXER—ECO STYLE

So the problem with dumping spent fixer down the drain is that it is loaded up with metallic silver and that is hazardous to put into the water supply. So, either bring your fixer to your nearest community photo lab with a silver recovery unit and dump it there, find out where to bring hazardous chemicals in your area (in the United States most areas have a disposal area for paint and other household wastes, and this is the same place you can bring your fixer) OR try this DIY method for leaching out the silver.

What you will need

- A big bucket.
- A packet of steel wool from the hardware store.

The process

Put the steel wool in the bucket with the spent fixer. The steel wool will turn black—that is the silver—and the liquid will likely turn rusty red. Drain off the liquid and save the steel wool to dispose of at your local hazardous waste facility. It is perfectly fine to save up the steel wool for years until you have a big bag. It won't hurt anyone.

Alternately you could purchase (or if you're crafty DIY it) an electromagnetic silver recovery device. In the United States a photographer named John Nanian (www.nanianphoto.com) has designed a small silver recovery unit for home photographers. It uses electricity to capture the silver from the spent fixer and, once the reservoir is full, it can be sent back to Nanian who will harvest the silver and send you a new reservoir + some cash (minus about twenty bucks + shipping) for your silver! Pretty cool huh?!

TINTING WITH VEGETABLES AND FRUITS

So as it turns out just developing with some of these eco-processes can tint your film one color or another. This comes as no surprise to those of us coffee and tea drinkers who are occasionally tortured by the dental hygienist as she or he scrapes the evidence of our addiction off our pearly whites. The same can be said for wine: it certainly has irretrievably stained a thing or two in my life. But what else? What other compounds are good for coloring film? As I wrote in Chapter 1 under the toning section, the difference between tinting and toning is that tinting colors the clear areas and to a certain degree adds color to those that are opaque (it is an even wash over the entire surface) but toning changes the developed silver to a different color. What I'm about to share is a discussion of *tinting* film with household materials. Please be advised that what is basically happening is that you are softening up the gelatin by immersing developed film in a bath and that can lead to more scratches/artifacts on your film.

So what household items can you use? Basically anything that causes a serious stain. I first got this idea over twenty years ago when a friend and I were using foodstuffs and spices to dye eggs. We used purple cabbage for blue, beets for pink, turmeric for yellow, carrots for orange, spinach for green. For the eggs we used vinegar to increase the acidity of the compound and make it adhere to the shells. When talking with another friend of mine, she told me about her grandmother, Miriam Cohen Rice, who used mushrooms to dye fabric. Later, when I visited her home in Mendocino we talked a bit about using mushrooms to dye film. Although I have never tried it (I am not a mushroom gatherer so using mushrooms would be prohibitively expensive for me) I know from Miriam that mushroom dyes are quite strong and so it might be a good option for those of you who live in an area replete with the fungi. Although her books, *Mushrooms for Color* (1980) and *Let's Try Mushrooms* (1974), are out of print, they can be found used or through libraries. I also recommend you check out various DIY sites on the web for fabric and egg dyeing as a way to get started. Once you find items that are easily accessible to you, try the process below.

What you will need

- If you already have soda ash you can use that, or, if not, I recommend getting some Borax as I use it for all kinds of applications, laundry, cleaning and especially getting rem-jet backing off color negative!
- A bucket to soak your film in.
- A big pot with a lid (go to your local thrift store and pick up a large pasta pot—just make sure it isn't aluminum!).
- A stove. You can also use a large mason jar (instead of a pot) and the sun (like you would make sun tea) to stew your dye. This takes longer but will ultimately be the most environmentally friendly.
- Some kind of organic material to produce your dye.

The process

1. First you need to decide if you are going to reel up your film onto a Lomo to do this or just dump it in a bucket. That will help determine your quantity needs. I am going to give you the recipe for 1L (the amount needed to dye 100ft of 16mm in a Lomo tank) but you can multiply or divide to fit the container you are working with.
2. Either in a pot on the stove or in a mason jar, combine your organic material and about 1.25L of water (this accommodates depletion of water due to absorption by the dye materials and steam).
3. Heat (on the stove or by putting the jar in the sun) until the organic material releases all of its color and/or the water is very highly colored. If you are using a stove but want to be eco-conscious, you can heat the water and pour it over the dye materials too and let it steep that way.
4. Set aside the dye and let cool to 30°C/86°F—to 40°C/104°F.
5. Strain your dye through cheese cloth or a fine-mesh kitchen strainer.
6. When your dye is almost at temperature, prepare a mild alkaline solution of warm (30°C/86°F) water and soak your film until it softens up a bit.
7. Put your film in your dye solution or your dye on your film.
8. Keep it there until the dye has reached the saturation you desire.
9. Hang to dry but DO NOT RINSE (unless it is super-sticky). Then gently rinse.

BE ADVISED—your film may be a little sticky. Also these organic dyes will likely fade over time so it is HIGHLY recommended that you transfer your film to digital or optical print ASAP if you want to preserve the look. Or you could just screen the film and re-dye and screen and re-dye until the emulsion falls off. Also an option.

FIGURE 7.9
Dagie Brundert's logo.

FIGURE 7.10
Dagie rinsing film. Courtesy of the artist.

The interview for this chapter is with a wonderfully funny and friendly German filmmaker, Dagie Brundert. I first encountered Dagie through the Facebook caffenol page when I was searching for non-toxic options for film developing during my most recent pregnancy. The information sharing on this site and other caffenol forums is really first rate. People are very interested in each other's experiments and always ready to help problem-solve. With Dagie's help I was able to develop film in both traditional caffenol (made with instant coffee) as well as a developer I made from grass clippings. I also made use of a fixer made from table salt that she shared with me. What follows is Dagie's biography and an interview with her.

BIOGRAPHY OF DAGIE BRUNDERT

I was born in a small town in the middle of West Germany. Beautiful nature, but boring after a while . . . I moved to Berlin and studied visual arts/experimental film. Fell in love with my Super-8 camera (Nizo) in 1988. Since then I try to be a particle-finder, a wave-catcher and a good story-teller. I try to absorb weird beautiful things from this world. Chew them and spit them out again.

INTERVIEW WITH DAGIE BRUNDERT (POLLY PHENOLY)

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a shaman, a performer?

Dagie Brundert: I've shot and developed Super-8 films for so long now, first I considered myself a "regular" short filmmaker, a story-teller . . . but it's floating more and more into the direction of alchemist now! Filmic alchemist perhaps? Material player! Gelatin layer player! :-) I feel I get deeper into the matter, into the grains and molecules! Understanding light and time.

KR: How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

DG: I'm already beginning to love your questions. I guess I must make a quick hop to my fridge and pour myself a glass of cold wine . . . hang on . . . I'm back!

I usually start with "I'm a Super-8 short filmmaker!" and then I say "the old analog stuff!" and then "I tell short stories, they are not really narrative, they are experimental but mostly full of joy!", then they produce question marks in their eyes so I add "I try to absorb weird beautiful things from this world. Chew them and spit them out again. With/on film!" Children understand that. Aunts as well!

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

DB: I was looking for recipes. I had been developing films for half of my life, I love puddling around and now I felt like checking out if there's something less harmful in this world. I stumbled across caffenol—photographers have used it for ages! For paper and negatives. So I thought: why not film? And the results were amazing. I wanted more. Tried to figure out what is inside coffee . . . reading a lot about chemistry, acid, tannins . . . in the end it's all phenols! Phenol! The beloved little sister of hydroquinone that is a main ingredient in most black and white developers. Call me Polly Phenoly from now on! I want to walk around and buy, pick up, steal local "healthy stuff" like flowers, weed,

leaves, local beer and wine, chuck them in a cauldron together with other magic powders and yeeeehaaaa!!!

KR: OK Polly Phenoly! Tell me more about your experiments with things besides coffee. Can you catalogue your first experiments? I have seen a film you developed with potato. What else have you tried and how do you determine the amount of phenol-producing ingredient to add?

DB: Coffee was my initial potion! Then I read articles about phenolic compounds in plants and herbs (they play an important role in cancer prevention and treatment by the way, which makes the whole stuff even more simpatico!) . . . and a chemical friend said: try potatoes! They contain a large amount! So I did: I squeezed juice out of raw potatoes—that recipe is one of my best!

As a chemical amateur I understand: phenols are tannins, acids, so I first tried the bitter, sour (parts of) plants like red berries, apples, red wine, Prosecco, sauerkraut . . . having no idea of how high the amount was, just trial and error. They worked more or less well. Prolonging developing time and raising temperature helps. I even made a kind of cross-check: what if I left the phenol part out and developed only in vitamin c and soda? Yes, you get an image, but a very, very pale one if at all. So the phenol compound is for blacks and contrasts I learned! The real silver attacker!

KR: What role does media/technology/tools play in your work. What is the relationship between the media/tools/and what your work is about? Is your work about something(s)?

DB: I'm not so sure if I understand what you mean. Media. Hmm. You mean about spreading my work? I love the internet and I love spreading my stuff and infecting people. But wait, reading it again, I think you might mean something else. Super-8—analog—technology. Instead of zeros and ones and pixels that I actually don't understand at all.

My tool is simple. My films are about simple things. The tool isn't much more than a camera obscura: a box, a hole where light gets in and a light-sensitive piece of plastic inside. (By the way, I experiment a lot with simple pinhole cameras right now and I'm so fascinated with how easy it is to capture light and time!) And then a more or less magic potion that transforms the captured, latent light molecules into something visible to the human eye.

KR: What I mean by this question is what is the relationship between your media (in this case Super-8 film) and your work? How does Super-8 and the camera help you make the work you make?

DB: Super-8 is the perfect media for me. Easy to understand and to handle, and so much more beautiful and magical compared with video! Real analog film colors, blacks, grays are by far deeper and profounder than their digital brothers and sisters. Or better: nieces and nephews. I don't want to see the world one-to-one, I want to see the insides and the cracked imperfectness and second-view beauty of the world by an imperfect and sometimes out-of-focus

(but in of heart!), partly unreliable but wabi-sabi-ish, always perfectly matching medium!

I play with coincidence. I am convinced that beauty is everywhere. I want to ban *(KR: DO YOU MEAN BURN?*—DB: YES!!! Maybe better: RECORD?) it on film so I step outside and capture it. No script. Just eyes and camera aware and awake. My work is mostly about small things. Little stories, one joke, one thought that evolves.

KR: How about your still photography? Did you shoot a lot of stills before you started shooting with pinhole devices? Do you now exhibit your pinhole photographs as well?

DB: Not really. Mostly only for documenting reasons. Pinhole photography has opened a new universe for me: capturing space AND time (because you have a long exposing time like many seconds or even minutes depending on the size of hole and box!). Through the pinhole you see your surroundings with other eyes. Moving people and cars vanish, plants move in the wind and leave weird blurred traces . . . it's simply totally fascinating! No exhibition so far (only on my website) but I plan to make large copies from my negatives and hang them somewhere!

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

DB: My favorite kind of show is a mixed one in a small cinema or club: some older films on a Super-8 projector (people love the rattling sound and for me it's like gathering around a bonfire) and newer films on a good beamer, digital. A bar at hand, good wine. Talking between and after films.

All my films are digitalized by now and online.

KR: And finally, your chapter is called "In the Soup 3: Hand Processing". Please elaborate how you came to such an activity? Are you part of a community of makers (either locally or internationally) who communicate with each other about their work and get together either virtually or physically to discuss/show/celebrate? Where? When? How? What happens?

DB: How I fell in the soup? ;-) As I said above: looking for new recipes, being tired of harmful chemicals and getting rid of them after use . . . and then: pure fascination. Simple things. Direct contact/influence on the material, love of smelling and touching and yes: analog (Super-8) film is sexy! I'm passing it on during workshops that I give every now and then, and people love it! Playing with food is finally allowed now!

I used to swim in my little bubble for many years, seeing other films on festivals, meeting filmmakers there . . . but always playing in my bubble alone. I feel it's changing now. We are connected anyway, internet making it possible, forums and Facebook are our multiplying playgrounds. The community plays world-wide. I got to know so many people in different countries who are so dearly

devoted to filmmaking, to exploring antique and haptic techniques (hand-developing, self-made emulsion, pinhole photography . . .) and renewing them with their own personal experiences (living at the seashore: using sea salt as fixer for example). Sharing the results with everybody. No competition.

KR: Can you talk a bit more about the communities you've worked with? You were in California recently giving a workshop at Echo Park. Where else have you given workshops? How do you make these connections? How does giving workshops influence your work?

DB: I started as a workshop teacher in 2008 when I was invited to be artist in residence at Echo Park Film Center in Los Angeles. Up till then I had no idea how it is to teach and to give away my experiences in film, and I must say that I like it; being an enthusiastic person, it's quite easy to infect others!

In the following years I was invited to do it again in such great places like LIFT in Toronto, WORM in Rotterdam, Schmalfilmtage (Small Format Days) in Dresden, Cambridge UK Super-8 Festival, Hamburg Short Film Festival, and Zeche Zollverein in Essen, Germany, just recently. My aim is to go to these places, look at and check what is happening and growing there, what's their local wine or beer for example, and mix it all to a unique regional soup to develop unique regional films shot by unique regional people in it!

Last quick, short questions!

KR: You also work in color Super-8. Do you develop that yourself? With a homebrew process or at the lab?

DB: I use the Tetenal kit, E-6 or C-41. But I heard from someone substituting E-6 regular process using less harmful stuff like coffee of course and hydrogen peroxide and lemon juice . . . haven't checked it so far! The color and bleach stuff is really poisonous!

KR: How do you dispose of your spent developer and fixer? Do you use the salt fixer or some version with sodium thiosulfate?

DB: I give it to my local recycler! It's for free here in Berlin. And I must admit: I always use "regular" fix . . . I'm not patient enough for the salty solution!

KR: Do you ever tone your Super-8 or prints with wine or coffee?

DB: I did it once with black tea, it's beautiful! Henna as well!

KR: I'm asking each of my contributors if they would like to share a thought experiment or assignment with the readers. Some have been straightforward recipes of the artist's invention, whereas some have been ways to help the reader free their artistic self. Anything you'd like to share?

DB: Hmmmmm . . . something like . . . activate and polish your inner antennas!!! Invite coincidence! Don't be afraid of accidents! Let wabi-sabi enter! They might turn your piece of art into something unexpected, unplanned, unique! And I'd like to share my flower tea recipe for any black and white film:

FIGURE 7.11
Dagie's jacaranda blossoms getting ready to stew. Courtesy of the artist.

FIGURE 7.12
Dagie collecting weeds to use in developer. Courtesy of the artist.

Dagie's flower recipe

1. Pick two large handfuls of any flower or weed that just happens to grow and bloom where you are.
2. Put it in a bucket.
3. Add a bit more than 1L boiling water.
4. Steep as you let it cool down to 30°C/86°F (maybe a little hotter).
5. Filter.
6. Pour off 1L into something where you can mix up your chemistry (a big mason jar works great!). Add 100g washing soda, stirring or shaking with lid on until dissolved.
7. Add 20g vitamin C until dissolved.
8. Use to develop your film, 30°C/86°F, 15 minutes (a bit longer if it's cooler).
9. Rinse (two water changes) with water.
10. Fix as normal.
11. Wash, 10–20 minutes running water (less if you use perma wash or hypo clear, more if you use plain water).
12. Hang to dry.

Dagie links

Pinhole pics: www.dagiebrundert.de/Pinhole-photos.html [accessed January 11, 2015].

All my films: www.vimeo.com/dagie [accessed January 11, 2015].

Wabi-sabi + workshops: www.wabisabisuper8.com [accessed January 11, 2015].

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CHAPTER 8

Doin' it in the Dark

Cameraless filmmaking/ darkroom printing

This chapter is about making photochemical films without cameras, or at least mostly without cameras. Back in the 1920s artist Man Ray first had the idea to put objects on top of photo paper and then expose that paper to light. He called these "ray-o-grams" and it wasn't long before he experimented with doing this on motion picture film as well. You can see the results of such efforts in his films *La Retour à la Raison* (1923) and *Emak Bakia* (1926), both available online at www.ubu.com/film/ray.html.

Such efforts require access to film chemistry, a dark room and patience as the work is rather painstaking and involves a lot of trial and error. Needless to say, it didn't catch on as a major strand of filmmaking either in the avant-garde or the mainstream. However, there are enough filmmakers who experimented with various darkroom printing techniques to warrant a chapter in this book. One of them, Austrian filmmaker Peter Tscherkassky, has become quite famous for his contact printing of found footage.

Contact printing in this context means laying already exposed and developed film onto unexposed (raw) stock and then shining light through it so that the image from the first is transferred or printed onto the latter. Tscherkassky has executed this in a very precise fashion with films such as *Outer Space* (1999), which is a reworking of *The Entity* (1981), a film starring Barbara Hershey. In Tscherkassky's reimaging he prints both sound and image tracks onto the film, often layering them and creating overlapping fractured visions.

Whereas Tscherkassky works with a laser pointer and is very precise about his efforts, other filmmakers have employed randomness by simply laying film onto raw stock and running a small flashlight or cellphone over it. Steven Woloshen discusses in his book *Recipes for Reconstruction* (2010) how to create a contact printer with a sync block, rewinds, a cardboard box and a goosenecked desk lamp. Others, such as Steve Sanguedolce, have used a flatbed 16mm film editor as a contact printer (see www.stevesanguedolce.com/Interview.htm). Obviously any efforts in this regard require the ability to get a room completely dark and somehow controlling the spill of the light source so that the unexposed film and that which is already exposed are not fogged unintentionally. In my

FIGURE 8.1
My homemade contact printing solutions: a small Maglite, discs of ND and full blue (the lens unscrews to allow me to place these). Also pictured is a set of 100ft modified film boxes that fit onto regular rewinds. They have a hole carved through them for the spindle to fit through and a small slit made in the side so that the stock can be pulled out and taken up. They work best if they are used with spring clamps.

own experiments I have created a variety of somewhat workable solutions for this, including modified 100ft Kodak film cans (the black plastic boxes) by cutting a hole through the center for the spindle of the rewinds to go through, making a slit on the side for the film to come in and placing a small black flap over it to help with light spill. A set of these with two daylight spools inside to wind the film, as well as a fairly controlled light source, such as a small penlight with a snoot of black wrap or tape, is sufficient when working with slow-speed film such as Hi-con or 50D. I also use discs of neural-density (ND) filters and full blue to adjust the intensity and the color temperature.

RAY-O-GRAMS

What you will need

- A darkroom OR a *dark* room (see Chapter 5 if you don't already know what I'm talking about).
- A small, controllable light source. I have a small Maglite into which I have cut so that ND and full blue filters fit inside the head (see Figure 8.1). This helps me control the amount of light. I also use my hand or some black wrap and tape as a snoot to control directionality and spill.
- Raw (unexposed) film stock. For your first experiments I recommend 7363—Hi-contrast black and white stock—as it is slow, fine grained and easy to develop.
- Something to create a shadow. This can be other film that you will lay on top of the raw stock, tacks, safety pins, whatever.
- A table to work on—you can work on the floor but, if you are like me, this hurts your back after a while.
- A processing can to put the film in as you expose it. I find a 1L can is big enough to put several strips in at once.
- Paper tape is useful but not necessary.
- Scissors.

The process

1. Get your workspace all set up, because once you turn out the lights you will be using your sense of touch to navigate it. Make sure you know where your shadow-making objects are, where your film can is, where your flashlight is and where your raw stock is.
2. Turn out the lights, wait for your eyes to adjust and make sure the room is light tight. If not, fix it.
3. Open up your film and lay it, emulsion side up, on the table. Film is wound so that the emulsion is on the inside, closer to the core. If you forget or you cut a strip and can't figure it out, put the film between your lips; the side that sticks is the emulsion side.
4. Using the paper tape, tape the film in place, emulsion side up. Again, this isn't necessary; maybe you could bring in a couple of paperweights to put on each end of the film? But if you don't do something, the film will curl up and you want it to lie flat, emulsion side up.
5. Using your sense of touch, put the shadow-making objects on top of the film.
6. Using your hand as a snoot, turn on your flashlight and run it the length of the film then turn it off.
7. Take the shadow-making objects off the film.

8. Put the film in the can.
9. Repeat with a new strip.
10. Once you have completed exposing your ray-o-grams and they are all safely in your film can with the lid ON you can turn on the room lights and go to wherever you develop your film.
11. Develop the film.

SUGGESTION: If you tried different exposure times or filters it works best to use different objects with these different filters (e.g. paper clips with a CTB filter, rubber bands with a CTB + .9ND etc.). Write down your variations as soon as you have turned on the lights so that, when you have developed the tests, you will be able to see which filter/lamp combo worked best.

CONTACT PRINTING WITH REWINDS AND SYNC BLOCK

What you will need

- A dark room.
- Rewinds with spindles.
- Sync block.
- Two spacers.
- Two spring clamps.
- Two daylights spools (one with unexposed film on it).
- Unexposed film—start with 7363 (Hi-con) for best results.
- Found footage that you want to print onto your film—on a reel.
- A take-up reel for your found footage.
- A controllable light source (see above/Figure 8.1) and a way to secure it over the sync block. Taping it to the arm of a desk lamp or goosenecked lamp is a good idea. I'm sure there are hundreds of DIY solutions!

FIGURE 8.2
(*Far left*) An example of a ray-o-gram my students made of bolts on 7363—Hi-contrast stock.

FIGURE 8.3
(*Left*) An example of a ray-o-gram my students made of rubber bands on 7363—Hi-contrast stock.

The process

1. Get your workspace all set up, because once you turn out the lights you will be using your sense of touch to navigate it. I put the daylight spool, a spacer, the take-up reel for found footage and a spring clamp on the right-hand spindle before I turn out the lights. I set up my raw stock and found footage, and make a couple of tape tabs to secure them on their take-up reels.
2. Turn out the lights, wait for your eyes to adjust and make sure the room is light tight. If not, fix it.
3. Put the raw film stock closest to you on the left-hand spindle, attach a spacer, put the found footage on the same spindle and put on a spring clamp. Then put both through the same reel in the sync block with the found footage on top and put two take-up reels on the right-hand spindle.
4. Use your tape tabs to secure the raw stock to the daylight spool and the found footage to the take-up reel.
5. Shine light onto the sync block spindle as you are winding the film from left to right. This method works best if you have an extra set of hands to hold the lamp OR you secure it so that it is in position. If not, you could fashion a snoot with black wrap and black tape, and hold the flashlight in your mouth. I have had reasonable results with this but it requires a bit

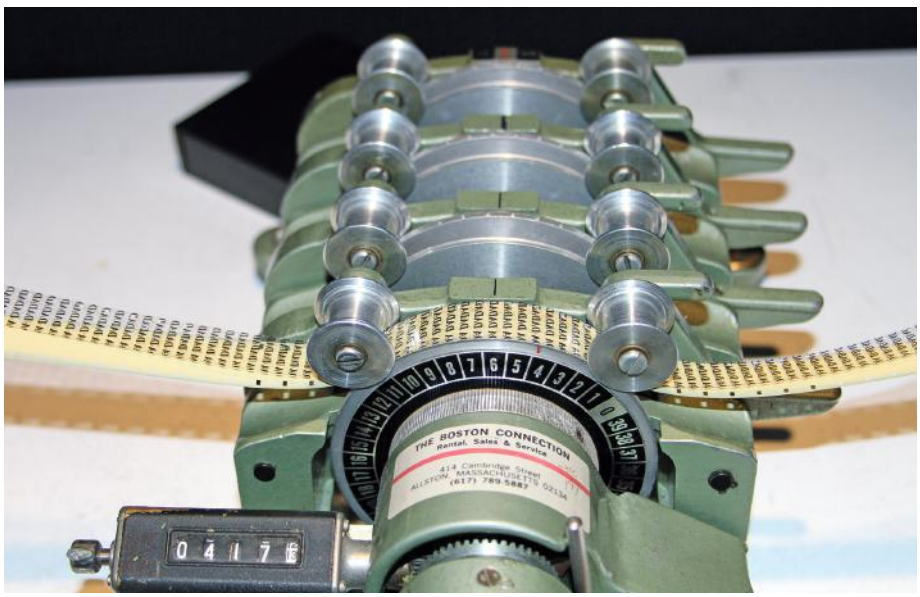

FIGURE 8.4
Titles have been printed onto clear leader with a laser printer. Then these titles are printed onto Hi-con stock by contact printing them on a sync block. Also see the film clip "Matt Shanafelt's Jeanne" on the website.

of coordination and it's a good idea to wrap some tape around the handle of the flashlight to provide a good place to bite. Another good solution is to tape the flashlight to the arm of a desk lamp or goosenecked lamp that you can position over the sync block.

6. Once you have exposed the film you can hand-process as you normally would.

I mentioned earlier that I used different filters in my flashlight. I cut them out of a swatch book for gels and experimented with different ones until I got something that worked. This involved a lot of testing on different strips of film and hand-processing them until I got the desired result. I highly recommend this for you as well. As you can see there are so many different ways that you can incorporate ray-o-grams into your cinematic toolkit. One of my students, Brendan Fields, took this idea of hand-printing and RAN with it. Instead of using a flashlight for a light source he used his iPhone. He created colored JPEGs in Photoshop and then used these to print on daylight-balanced color negative film. You can see the results on the website. The film is called *Untitled #2* and what follows are his instructions for how he did it.

BRENDAN FIELDS—CONTACT PRINTING BY HAND: UNTITLED #2

Materials

- Hi-con 16mm.
- Ektachrome 16mm
- Color neg—7203—50D.
- iPhone.
- Bolex.
- JK optical printer.
- Filters for optical printer, 1 full blue.
- F-4 exposure .3 secs lamp at 90V.
- Black acrylic paint.
- Paint brush.
- Regular 8 × 11 copy paper.

What he did

1. Originally it began when he wanted to contact print on 35mm but this was short lived. He wanted 35mm to have more space on the frame to have image or mask. He was going to do ray-o-grams on 35mm but ended up painting cells (Figure 8.5) and shot them on 16mm with Hi-con for about 24 frames. He created 23 mattes (Figure 8.6). Then he hand-processed all the Hi-con.

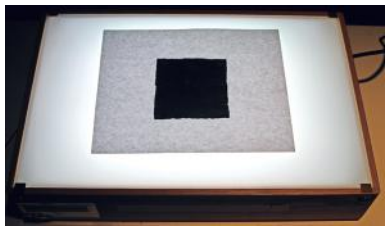

FIGURE 8.5

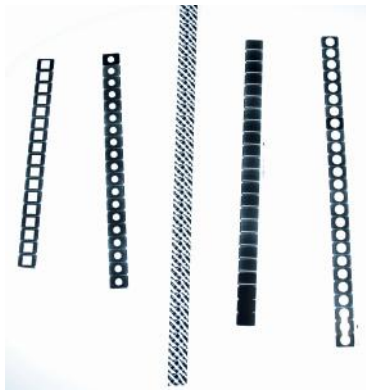

FIGURE 8.6

FIGURE 8.7

2. Brendan selected colors in Photoshop, made them into JPEGs and loaded them onto his phone. His colors were red, blue, green, orange, purple and yellow. With each matte you could have thirty variations (Figure 8.7).
3. Then he contact printed onto Ektachrome using two colors as follows:
   a. Cut a foot or so of Ektachrome (Figure 8.8).
   b. Laid on splicer to line up with Ektachrome underneath, matte on top.
   c. Exposed to a single color (Figure 8.9).
   d. Removed matte.
   e. Exposed to a different color (Figure 8.10).
   f. Put them in a can.
4. Hand-developed Ektachrome strips.
5. He ended up with 102 short pieces of film.
6. With a digital camera he photographed one frame from each strip on digital and brought them into the final cut in a 24FPS timeline with music that had already been composed with a musician friend. He animated the frames to the music. This provided a "map" as to what frames to shoot

FIGURE 8.8

FIGURE 8.9

FIGURE 8.10

for how long. So when he went to the optical printer he knew exactly how many frames to shoot of each image.

7. Brendan cut his own negative. He only had eleven splices including adding in credits and most of these cuts were in the credits. In the image there were only three edits to cut out a mistake and to splice a roll.

HALF-PROCESS

Half-process is a name I made up myself for a technique that results in the intentional and precise processing of reversal film as part reversal image (positive) and part negative image. It really should be called both process but calling it half-process helps me remember that I stop developing half of the film, partway through the process. I was first introduced to this process by filmmakers Anja Dornieden and Juan David González Monroy in their film *Oro Parece* (2012), although I have been told that Australian filmmaker Richard Tuohy originated the process. All of these filmmakers continue to work in and champion the use of celluloid, and are part of a worldwide network of independent, artist-run cooperative film laboratories. Richard Tuohy runs nano lab in Daylesford, Australia, and Dornieden and González work out of LaborBerlin in the German city of the same name. Please look at the artists' websites at www.nanolab.com.au/richard_tuohy.htm and www.ojoboca.com for clips of their work and contact information.

The process involved hand-developing either black and white or reversal color film, and applying cellophane or paper tape after the first developer (and wash) and before the bleach. The film is then bleached and re-exposed to light (or chemically re-exposed), and then the tape is removed and the entire film is fixed. What results are areas of the film that are positive and others that are negative. If you look at the film *Oro Parece* (www.ojoboca.com/index.php?/film/oro-parece/) you can see that it is possible to be quite precise in the application of the tape. What follows are instructions for completing the half-process in black and white.

What you will need

- A roll of black and white 16mm or Super-8 reversal film that you have shot but not developed.
- All the chemistry, equipment and supplies to develop the film as reversal (see Chapter 4).
- A roll of cellophane tape—frosted is better as you can see it on the film and that makes it easier to remove. Paper tape also works and comes in more narrow gauges although it is more likely to fall off in the process.
- A light table is nice but not necessary.
- Some sort of cutting device, a blade, scissors, whatever you feel most comfortable with, to cut the tape to apply it to the film.

The process

1. Put the film through the first developer and wash. It is a good idea (although not necessary) if you use a stop bath before the wash to stop the development of the silver halide grains in the film.
2. Hang the film to dry. At this point the film can be handled in white light as long as the developer is COMPLETELY RINSED OFF THE FILM. Otherwise you might get a little to a lot of solarization. Which could be cool, but might not be what you are going for.
3. Once the film is dry enough for tape to stick to it, apply tape to the areas that you would like to be negative images. You can work over a light box at this time. Basically there will be developed areas (black) and undeveloped areas (gray or white emulsion depending on what film stock you are using).
4. Once you have adhered tape to your liking, you can pick up the developing process where you left off—bleaching, washing and putting the film in the second developer.
5. After the second developer—STOP and carefully remove the tape BEFORE fixing the film.
6. Fix the film—converting all of the silver halide particles (the undeveloped film) to soluble silver thiosulfate that is washed off with the fix and the final washing.
7. Dry your film.

I began this chapter talking about Man Ray and I'd like to end it by talking about these artist-run film laboratories that have been popping up in the last fifteen to twenty years. The first time I was in contact with such a place was while doing my dissertation research for my doctorate in Anthropology. It was the late 1990s and I had an email discussion with someone working out of L'Abominable (www.l-abominable.org) in the suburbs of Paris. We had connected via the experimental film listserv frameworks, which remains one of the most vibrant and important online communities for experimental filmmakers, despite the frequent flare-ups and flamewars common to any such community (www.hi-beam.net/fw.html). Although I'm sad to say my notes are lost to time, when we exchanged emails the rationale for starting the (then relatively new) artist-run lab was that commercial laboratories were closing and that artists who wanted to work in film felt they had little choice but to create their own lab.

In 2012 I visited L'Abominable and a more recent self-described atelier of experimental cinema L'Etna, also in Paris, as part of a tour organized by the directors of the Collectif Jeune Cinéma. Both laboratories had a variety of equipment reappropriated from the commercial film industry in the region including bath processing tanks, contact printers, animation stands and telecines, as well as hand-made solutions to small-batch processing including a hand-machined 100ft reel for 16mm process and a film dryer made out of a salad

spinner. At L'Abominable they process both color and black and white film on a regular basis. As of this writing there are over thirty small labs like this in the Americas, Europe, Australia and Korea (www.filmlabs.org/index.php/labs/). Most are unlike conventional labs in that, in order to get your film work done, you must become a member and actually do some or all the work yourself. All of them focus on small-gauge, Super-8, Regular-8 and 16mm film, and personal, artistic, artisanal production. Thus they are all comrades in arms with the author of this book. Through necessity and a desire for freedom to practice their work, the artists have taken control of the means of production and created a vibrant and nurturing alternative to working through/with the institutions of commercial cinema.

This is, of course, a large part of what this book is about. Many of the people whose work I discuss and all of the individuals I interview are associated with me in one way or another through mostly informal networks and friendships developed over many years and long distances. Some of them I know through my position teaching film at Emerson College. Some of them I met while in graduate school or at film festivals, or through friends of friends. I write about their work because I find it as well as them inspiring. The woman whose interview ends this chapter, Lauren Cook, was a student of a friend of mine, Sasha Waters Freyer, while she was teaching at the University of Iowa. Lauren went on to teach at the University of Hartford where she is currently the Program Director. Although I might have met her prior to this, in 2006 she organized

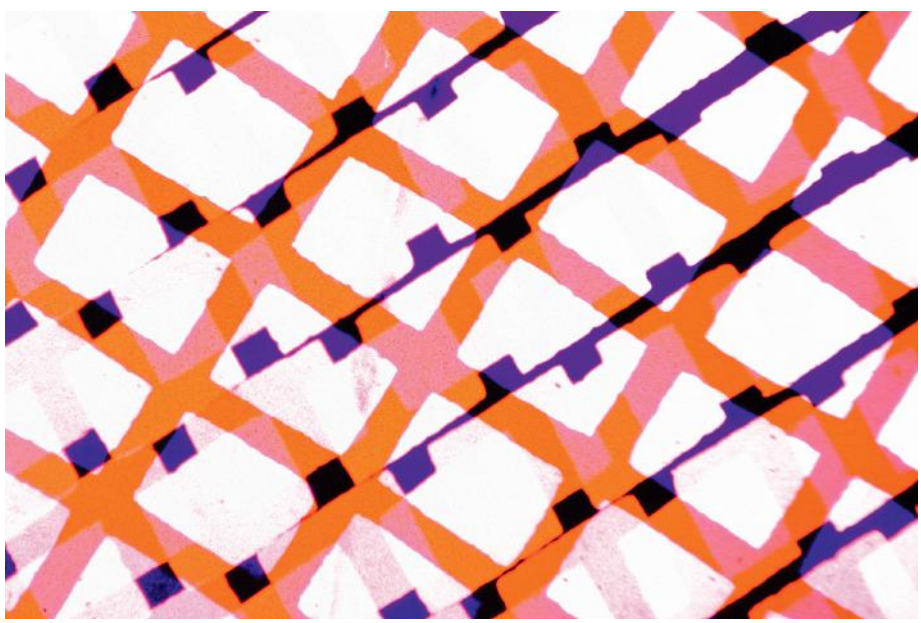

FIGURE 8.11
Film still from *PXXXL* by Lauren Cook. Courtesy of the artist.

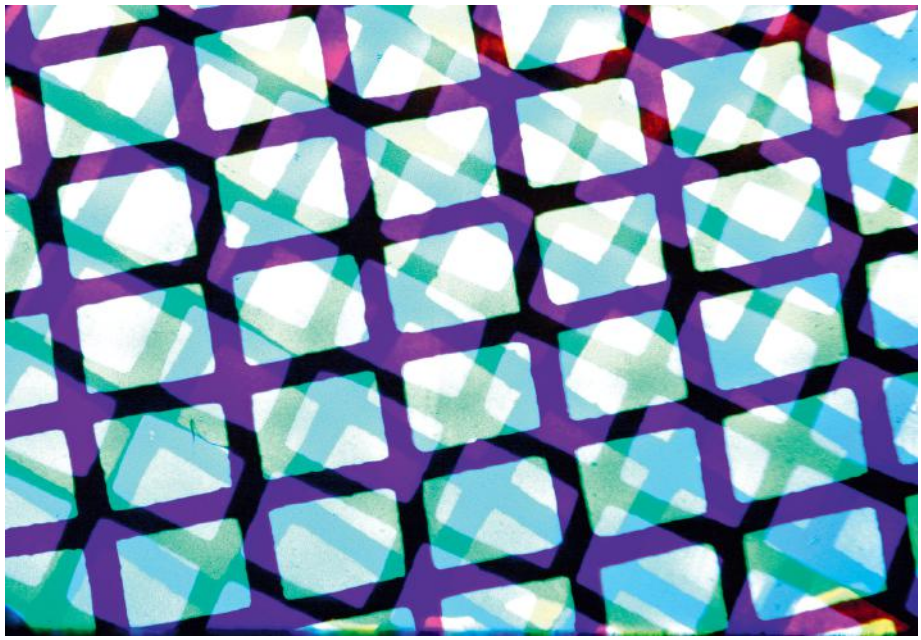

FIGURE 8.12
Film still from *PXXXL* by Lauren Cook. Courtesy of the artist.

an international conference *Feminism(s): Film, Video, Politics* at which I spoke and where she showed her own work. I became an instant fan of her hand-made cinematic style and when I saw her 2012 cameraless film *PXXXL* I knew she had to be in this book (see the film on the website). What follows is an interview with Lauren in which she discusses her work.

INTERVIEW WITH LAUREN COOK

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a new media practitioner, a shaman, a performer? How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

Lauren Cook: I consider myself an artist. Although, when people ask, I usually just say I'm a professor because that's an easier thing to explain. When people ask what kind of films I make, I usually say abstract films. Most people have no idea what an experimental film is and I also don't really like to limit the idea of what type of film I'm making. I'm more and more frustrated with the label of experimental because I think it actually inhibits creativity and new approaches. Once you create a mold, people contextualize their work in that way and build upon previous forms. This can be a great thing when people push forms in new directions. It can also create barriers as well by making

work inaccessible and field-referential. I see so much experimental work that only really has an impact for people who are in the know and understand its references and process. I like to create films that engage both in an experimental context, but also with any person who watches them. I have a personal test for work where I imagine how a particular friend would view a particular film. This person is an intelligent person who is interested and curious. She's been to museums, but isn't completely versed in theoretical underpinnings of each particular artistic movement. She's probably seen some interesting YouTube videos, but hasn't been to an experimental film festival. I feel like she's the perfect litmus test for someone who I want to be able to engage with my work. I don't think that you need to dumb work down or conform to make a film that has multiple entry points for different viewers.

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

LC: For me, making experimental films is a political act. I worked on big-budget commercials in LA during 2002–2003. I quit a really great full-time job in LA the day I witnessed two little girls brushing each other's hair discussing whether or not they were pretty enough to be in a commercial while waiting for a wardrobe fitting. Shortly after, I saw my first experimental film and it opened my eyes to the possibilities of the moving image as a form of protest and revolt. That's when I started making my own films.

Generally, my films are responses to events or experiences that have struck me in a particular way. Like celluloid, we are all struck by the totality of our experiences with the world. With film, the result is 24 frames per second. With people, a lifetime of experience comes out in everything we do. I like to imagine my actions as one really long exposure sometimes. You see these long exposure shots of very busy places sometimes where the streets are just blurs and only the buildings remain visible. Moments come and go, but there are thoughts and concepts that remain constant enough to be like those buildings in the long exposure of our lives.

I mostly became interested in darkroom process because I don't like waiting. The idea of sending work out to labs and the lack of immediacy felt like such an inconvenience. This didn't make me want to stop using film though. It just made me want to process it myself! I got some photocopied papers that were passed around by filmmakers and then later was able to get my hands on *Recipes for Disaster*. I also did a ton of internet searches about different chemicals and ways to do certain processes. Over time I processed black and white negative and reversal as well as E-6 color. I've tried to cut down on this somewhat though recently because I partially lost my sense of smell and somewhat taste for a while once after processing color. Darkroom safety is really important and something I wish I learned more about when I first started making this kind of work.

KR: What role does media/technology/tools play in your work. What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

LC: *Altitude Zero* was very much about that experience I had watching the two girls. I felt responsible for helping to create this idea for them that they had to be perfect. I thought a long time about what I could do as an individual to do anything different. In a capitalist society where the goals are always more, newer and quicker, how can you do anything to prevent those girls sitting there in that moment and questioning their own value, looks and identities? That's what made me start actually destroying found images of women performing for the camera. I wanted to create some sort of filmic Frankenstein or palimpsest that showed what was behind the image. I wanted to make the viewer uncomfortable watching something that was created to give them pleasure. I also wanted the work and painstaking process of cutting and pasting each frame to be very evident in the product. I guess it's like ritual of any other kind or perhaps some form of penance. I cut the frames and bleached them each night and thought about the many views: my own, those girls, the women in the images, and the eventual audience and eventually the film came together.

HandMade is about this idea of film being "dead". I went to graduate school at a time when schools were throwing all their film equipment in dumpsters. There was this shift taking place to the digital formats because it was seen as cutting-edge, cheaper and faster. I thought it would be fun to try to create a film using 35mm (because it's the format that was/is dying out in movie theaters) in the cheapest way possible, but make it something that couldn't possibly be made with a digital format. The total cost ended up being under $300. I used three strips of found footage, a heart, focus leader and a hand, and spent days in a dark room contact printing them onto Hi-contrast film. I used several negative/reversal/solarization processes to create enough strips of film. I scratched a soundtrack onto the portion of the film that would normally have an optical track. Then I used a gang-sync and flashlight to make a print. I specifically didn't fix the print because I knew it meant that the image would eventually disintegrate from the celluloid. I plan on rephotographing the process each ten years that I'm alive. Even if it is eventually only a clear strip, the power of the film is in what was only once there. It's a film about technology not being rooted in the new, but being about innovation with all tools and forms.

PXXXL is also about the turn to the digital. I noticed that many artists in film and other mediums, like painting and photo, began using digital glitches to disrupt their images. The whole fetishization of the digital was fascinating to me and seemed to be a really interesting representation of capitalism. Digital glitch is an interesting marker. It can't actually exist without its host image, but is also something unique. It's an artifact, time stamp and an error all in one. I wanted to create a film that looked digital using technology that has been available for over one hundred years. Even though a filmmaker could have created *PXXXL* one hundred years ago, they never would have because

pixels didn't exist. For me *PXXXL* is sort of like a time glitch. I also think it would be impossible to create this film by digital means. The photographic process couldn't be replicated by digital means. Even simple digital layering never looks as good to me as multiple exposures on film.

I made *PXXXL* entirely in a color darkroom—meaning no red light like the one that can be used with Hi-contrast black and white development. I used Super-16 color print stock that has the same speed as color photo paper. I made contact print tests on photo paper first to get my timing down. Then I printed small strips of the print stock about a foot at a time. I built a set-up that allowed the rest of the film on both ends not to be exposed. This allowed me to only expose about a foot at a time. I used several screens to create grid patterns and created many different colors through layering color on the film and thinking about how multiple color exposures would look as I removed and added the grids. I wanted to get contrasting colors and not end up with just black from exposing the film too much. I also used hand-made lenses that allowed light to filter through in certain patterns. I used some jelly bracelets that had a grid pattern. I'm attaching an image because it's a little confusing (Figure 8.13). I don't have the actual ones I used currently with me or I'd just take a photo of those. They are in my office at school. I painted them with several coats of black and then cut the tips off of some of them so that I could use them to project light through some parts and not other parts. I call these lenses because they guide the light to create various patterns of images and are actual 3D objects. I also thought about the grids I used and made sure that they were a certain size to where they would auto-animate from frame to frame. You see Man Ray's contact-printed film *La Retour á la Raison*, where nails flash by and the tacks remain in the same position in the frame. When Man Ray arranged them in exactly the same position on each frame with only a tiny bit of motion, the tacks seem to move on their own whereas the nails appear to stay motionless as we see them flash on the screen. I'm doing the same thing in *PXXXL* that Man Ray did with the tacks, but with screens that hit in nearly the same place each frame. The slight difference in location from one frame to the next creates motion of each individual square. I created different motion by changing the screens in different ways. It's really just math. It sounds simple now when I explain it, but it took me a couple years of research, trial and error to make the film.

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

LC: I show my work in film festivals, galleries, museums and on the internet. Every film I make is available for anyone to watch online. I also recently did an animation film tour called Women with Knives with two other filmmakers where we played venues like music halls, galleries and outdoor spaces. The goal was to broaden our audience and show our work in venues outside traditional experimental film contexts. Many of the people who saw our films on this tour had never seen an experimental film.

FIGURE 8.13
Lauren's jelly bracelet lenses for *PXXXL*. Courtesy of the artist.

KR: You've organized symposia, participated in screening tours, all kinds of things. Can you talk about the role these various communities and your participation in them plays in your work?

LC: I like to think about curating events as being very similar to making a found-footage film. The organization and way a program of work is put together is much like editing. More and more younger filmmakers are starting local screening series and festivals. Sight Unseen in Baltimore, Big Mama's Cinematheque in Philly, Unexposed in Durham, and Contraband Cinema in Atlanta are all great examples of a few people organizing successful screening series and hand-made filmmaking workshops. It doesn't take a venue or money. You can set up in a bar on an off-night or in your basement. Use whatever you've got in your town. You don't have to go the movie theater route. Ask filmmakers if you can show their work or look for people traveling through on tours. Most people just want to get their work out there. Don't be afraid to email and ask people if you can show work you like. Borrow a projector and bring it to the masses!

By creating events, you can build a community for your work and the work you like to watch. So few people have seen this kind of work. I know for me that it changed my life and I hope to give other people that opportunity to really see from a new perspective, outside the commercialized view of industry and narrative work.

Lauren's assignment for you: curate a film screening

1. Decide on which films you want to show. Many filmmakers will let you show their work if you just send them an email and ask. Don't be afraid to get in touch with people whose films you like. Think about specific films that might be of interest to the people you want to come.
2. Book a venue—it can be a backyard, garage, basement, bar, classroom or even a concert venue. If you're using a residential space for your venue, just give your venue a name and put a sign up before the event so people know they are in the right place.
3. Write a press release. If you've never done it before, Google "how to write a press release". Writing a press release is an art form and can make or break any event. Send it to your local media. See how many papers/radio stations/online sources you can get to cover your event. Sometimes they will publish your press release as an article, put your event in the calendar section, or they might write something on their own.
4. Promote your event in other ways with flyers, social media, telling everyone you know, etc. If you start with screening local filmmakers, their friends will come and you have an audience. You can build from there and send out notifications for each event to build your following. If this is going to be an ongoing series, give your microcinema a name so people recognize your events.
5. Get a projector. Some venues will have a video projector in their space. If not, see if you can borrow one. Sixteen millimeter and Super-8 projectors are cheap on eBay, and can sometimes still be found at thrift stores. [Author's note: another great place to check are college, university or industry "surplus" stores. When I lived in Seattle, I got all kinds of weird stuff at the Boeing surplus store! My friend John Freyer used to pick up weird stuff at the University of Iowa surplus store. Once we found a film printer there!]
6. Get everything together ahead of time. Make sure you have all the files/films/prints well ahead of time. Don't wait until the last minute to build a timeline of files for your screening.
7. Do a run-through rehearsal. Make sure you have all the technical kinks worked out so that you don't get delayed with your start and annoy your audience.
8. Have fun, meet new people in your community, bring underground cinema to the masses!

[*Author's note*: also, any time you get together it is a great idea to invite folks to bring refreshments (unless the venue forbids it).]

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CHAPTER 9

Optical Printing

DIY

In Chapter 3 I discussed the use of the JK optical printer in a fairly straightforward manner as a means to do simple rephotography, resizing of the image, speed changes, superimpositions, dissolves and traveling mattes. With the exception of the last bit, these effects are fairly easy to accomplish once you get the hang of the machine and, even though Jaakko appears to be retired, there are still enough JKs around and people capable of their upkeep that without too much trouble you, dear reader, ought to be able to locate one to rent or borrow, or perhaps even purchase. Should you buy an optical printer and desire to augment it, or should you wish to build yourself one from scratch (as Bill describes doing with Paul Sharits in the interview in Chapter 3 and as Peter Rose describes at the end of this chapter), there are resources out there on the web and through forums to guide you in your work. For the most part, I love my optical printer. Basically, my filmmaking is a little rough, a little grubby, with chance and mistakes embraced as a central part of my practice. As such, my cranky analog JK works great for me. I haven't changed it one iota since I bought it and it does everything I need it to do very well. On rare occasions I have had an optical technique that required more specialized gear and in those cases I have usually managed to get myself onto an Oxberry animation stand with aerial image projection to accomplish those goals. This chapter moves in two directions at once. It will discuss the highly specialized optical printers developed for the major motion picture industry and their use by avant-garde filmmakers, the augmenting of existing JK and other optical printers to create specialized machines for individual artists and the DIY (Do-It-Yourself!) optical printers from the 1970s and today.

OPTICAL PRINTERS AND THE MAJOR MOTION PICTURE INDUSTRY

Before digital effects, all special effects in the movies were accomplished through a combination of in-camera/on-set effects with complicated sets and mattes and paintings on glass in front of the lens combined with post-production optical printing. Raymond Fielding's *The Techniques of Special Effects Cinematography* is an excellent overview of the various machines and machinists involved

in this practice. All the different fixes that were developed and perfected to achieve the filmmakers' goals are truly inspiring. This is true of the early optical printers, many of which were designed in large part to accomplish a goal of a director who had very little idea of how they (and the people who built and operated them) worked to achieve the director's "vision".

The first mass-produced optical printer was the Acme-Dunn printer. Made for military applications during World War II, by Linwood Dunn and Cecil Love, this printer received a technical academy award in 1944 (Fielding, p. 128). Called the Acme printer for short this device shared the majority of the commercial market for printers with Oxberry printers made by the Richmark Camera Co. out of New Jersey. The BHP Corporation of Chicago and Pioneer-Trebes also contributed printers to the field (SMPTE, p.684). When I started my film career, it was possible to find JK optical printers and Oxberry animation stands and possibly their printers at most film schools. Animators in particular seemed to love the Oxberry Master animation stand for its motion-controlled platen and the ease of creating fades and dissolves. Since the conversion of special effects and animation from analog/silver-based technologies to digital, studios and film labs have literally been giving Oxberries away or, worse, scrapping them. In contrast to the tabletop JK, an Oxberry requires a significant commitment of space, extra tall ceilings for the Master animation stand and a large room for the multiple-projection head step printers.

Over the last ten years that I've taught at Emerson College, we have had many offers to donate Oxberries to the college and most have been refused. We currently have a disassembled unit in storage as we wrangle with our facilities managers, architects, administrators and other faculty to find space to commit to the unit. Of course the arguments for and against its incorporation into our facilities are impassioned and spring from sound pedagogical rationales in keeping with the ongoing battle between those who wish to continue to use film technology and those who wish to see its back. In contrast with a basic projector/camera set-up (which would be relatively easy to cobble together from spare parts with a decent amount of technical know-how) making a multi-projector motion-controlled optical printer would basically be like building the space shuttle from scratch. Not impossible, but there would be a lot of tech you'd need to reinvent.

One artist who made remarkable use of commercial optical printers is Pat O'Neill. It was seeing his films *7362* (1965–1967) and *Water and Power* (1989) that made me want to experiment with traveling mattes. Unlike my crazy antics, O'Neill's work is *clean*. It is also shockingly beautiful. *7362* is the number of the Hi-contrast 16mm motion picture stock made by Kodak that is used in traveling mattes. The film features biomorphic and mechanical forms in strongly contrasting colors pulsing and whirling around the screen. It is a masterful homage to the capabilities of the optical printer, and the stock and method that it represents.

FIGURE 9.1
Still frame from Pat O'Neill's *Water and Power* (1989). Courtesy of the artist.

Water and Power (see Figure 9.1) was shot in an office building in LA and the Owens Valley, and takes its name from the Los Angeles Department of Water and Power. The overlapping images in these spaces visualize the way in which the land is a palimpsest of all the natural and man-made efforts on it. Nature and culture course across the surface of the planet, leaving their traces and attempting to wash or work away that which has come before but the residue of processes is never entirely erased. With his stunning layers of superimposed images, O'Neill visualizes this perspective in a way that all the talking and writing in the world could never achieve. The film is breathtaking 35mm and has been preserved by the Academy of Motion Picture Arts and Sciences and added to the National Film Registry. O'Neill continues to live and work in the Los Angeles area and can be contacted via his website: www.lookoutmountainstudios.com/index.php.

FIGURE 9.2
Pat O'Neill with his two optical printers. From an email communication with Mr O'Neill: "Both optical printers were made by Producers Service Co. in Burbank, California. Both were used in special effects houses, and bought second-hand by me. I don't know any other filmmaker who used such equipment. The double-head printer, on the right, has not been used since 2000, and the other printer was converted to a scanner about five years ago." Photo by Jennifer West, courtesy of Pat O'Neill.

There are few contemporary experimental and avant-garde artists who have the tools, the skills and the patience to do the kind of precision optical work that O'Neill did (see Figure 9.2). He was uniquely placed in time and space to become the artist he is. However, people continue to be very interested in optical printing. In the previous optical printing chapter, I wrote about traveling mattes and superimpositions and burned in titles, all of which I have accomplished on my little JK rather nicely and all of which you could do on a tabletop unit as well. The rest of this chapter is about building your own printer or modifying existing printers to suit your needs and there are four

"case studies" of individuals who have done so. In every case, the tinkering was done in order to achieve a specific effect and usually progressed over the course of several films, if not entire careers to date.

BASIC DIY OPTICAL PRINTER

The basic components of an optical printer set-up is a projector and a camera that can advance a frame at a time (or can be modified to do so). I have seen home-made optical printers using Beaulieus, Filmos, Mitchells, Kodak Cine Specials and Arris with Super-8mm, 16mm or 35mm capabilities. Some, like Mitchells, are often made to work with either 16mm or 35mm film and simply require a gate change inside the camera. Almost always optical printers have a dedicated camera. In other words, once they are set up they stay set up and the reason for this is that the fine adjustments necessary to set up a camera perfectly aligned with a projected frame, or more frequently the actual backlight frame of film, are so tedious that, once completed, it is unlikely that the maker will want to disconnect everything to shoot. But it doesn't have to be this way; it is just something to think about as you design your own system. To design your own system you will need:

- A film projector in the gauge of your choice with single-frame advance capacity and/or an inching knob. In 16mm that is something like a Kodak Analyst or Pageant that can single frame. Some of these even come with a corded remote or pedal to advance the film and they can run forward and reverse. If you are working with Super-8 there are Eumigs that have inching knobs and many of the old silent projectors in Regular-8 and 16mm formats have gate assemblies that can be removed as a single piece away from the shutter and lamp, and have inching knobs attached. Then you are left with the problem of finding a light source that is powerful, cool and easy to focus.
- A camera that can single frame in the gauge of your choice. Popular choices are reflex Bolexes, Beaulieus and Mitchells, the former two in Super-8mm or 16mm.
- A single-frame adapter or an animation motor so that you can advance the film without jiggling the camera.

In order to set up the camera to shoot the film you will need to do one of the following things:

- Have an optically clear mirror, ideally mounted in a black box with just the projected image coming in one side and the camera filming in from the other, which would look like Figure 9.3.
- OR using an extension tube or bellows extend your lens so that it can shoot an extreme close-up of the gate (see Julie Murray's design below).

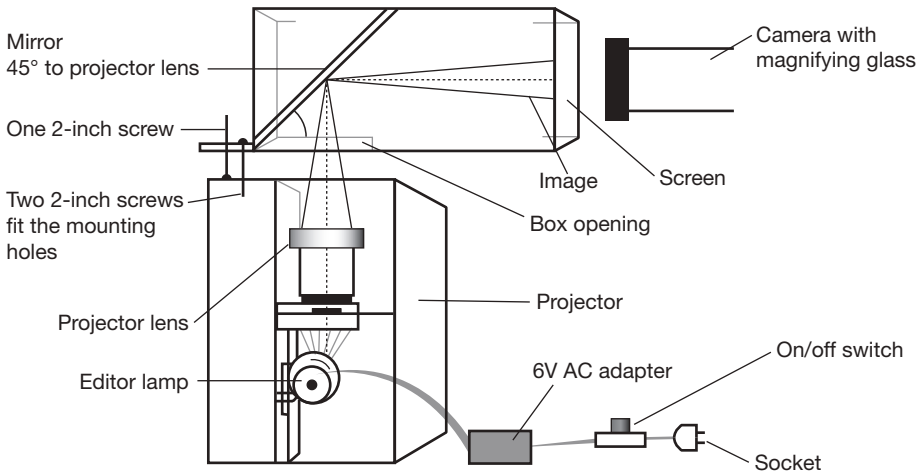

FIGURE 9.3
An illustration of a rudimentary optical printer set-up found as part of the description by Raul Lopez Herrera of his Super-8 to Super-8 system, www.city-net.com/~fodder/s8mm/optprint.html.

- OR (and this requires more space and a light-tight room) project your image onto a piece of frosted glass or glass with vellum on it and frame up your image on the other side. NOTE: unless the film that you are copying has sprockets on BOTH sides so that you can flip it right to left, your image will be backwards.
- OR (also requires a very dark room to work) put your camera right next to your projector, project onto a white surface and film. Carolee Schneemann did this in the credit sequence for *Plumb Line* (1968–1971) and it looks amazing.

A system designed with just these pieces should be able to reproduce film frame for frame as well as create superimpositions, speed changes and even titling. Below is a home-made optical printer by Julie Murray. Julie is an Irish-born artist who lives and works in the United States. She makes work in a variety of mediums including drawing, painting, sculpture, film and video. In the early 2000s she built her own printer. Her description of her process as well as pictures are below.

JULIE MURRAY—BASIC DIY OPTICAL PRINTER

For the projection part of the unit, Julie used a Bell & Howell 16mm projector and she cut away the housing around the gate, removing the shutter and lens. She replaced the light source that came with the film projector with a slide projector that provided a cool (as in blue) and very bright light positioned

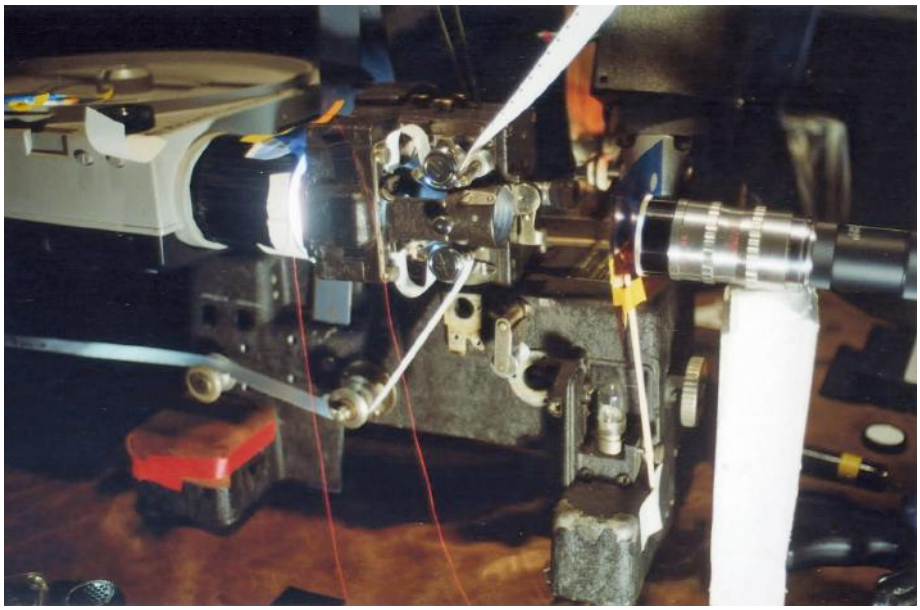

FIGURE 9.4
Close-up of the gate on Julie Murray's printer. Notice that there is no lens on the printer and the camera lens has an extension tube on the back.

directly behind the gate (see Figure 9.4). A Bolex with an extension tube and lens was positioned opposite the projector gate (much like a JK optical printer) so that it was framed and focused on the gate. The extension tube was sufficient to create the macro focus required. There was a slow motor attached to the inching knob so that the projection side of the device could be set up to "run" and the Bolex was mounted on a standard tripod (see Figure 9.5). Julie says that there was a significant amount of taping and shimming involved in setting up each session and her film *If You Stand with Your Back to the Slowing of the Speed of Light in Water* (2004) was filmed on this set-up.

Julie mentions on her blog where she discusses making and working with this printer that she was inspired by Standish Lawder and a contact printer he made that filmmaker Mark Toscano posted on his blog (Toscano). Standish Lawder also made his own optical printer that he demonstrated when Robert Gardner interviewed him and Stanley Cavell on his show *Screening Room* (Gardner). Filmmakers inspire each other across the generations not just with their artwork but also with their techniques and tools.

After building and working with her own optical printer Murray acquired a JK that she continues to use to this day. Recently she sent me this picture. It is an iPod leaning against the gate area of a JK rig so that she can shoot titles for her film (Figure 9.6). Shooting with color 100ASA color neg, she framed up the image so that she could get about one inch of text. She inverted the image

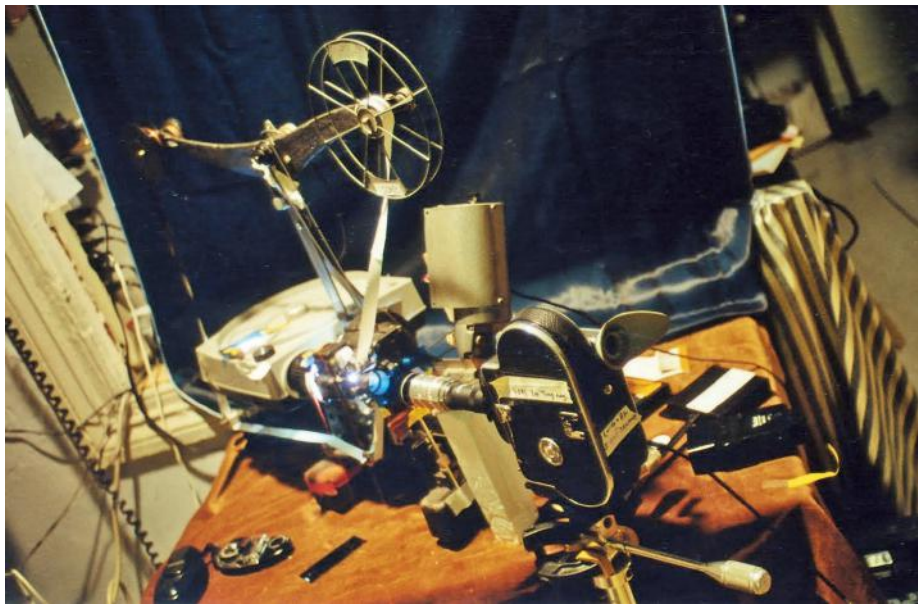

FIGURE 9.5
A shot of the whole set-up in which you are able to see the slide projector, take-up reel, camera on a tripod and the small table that it is all set up on.

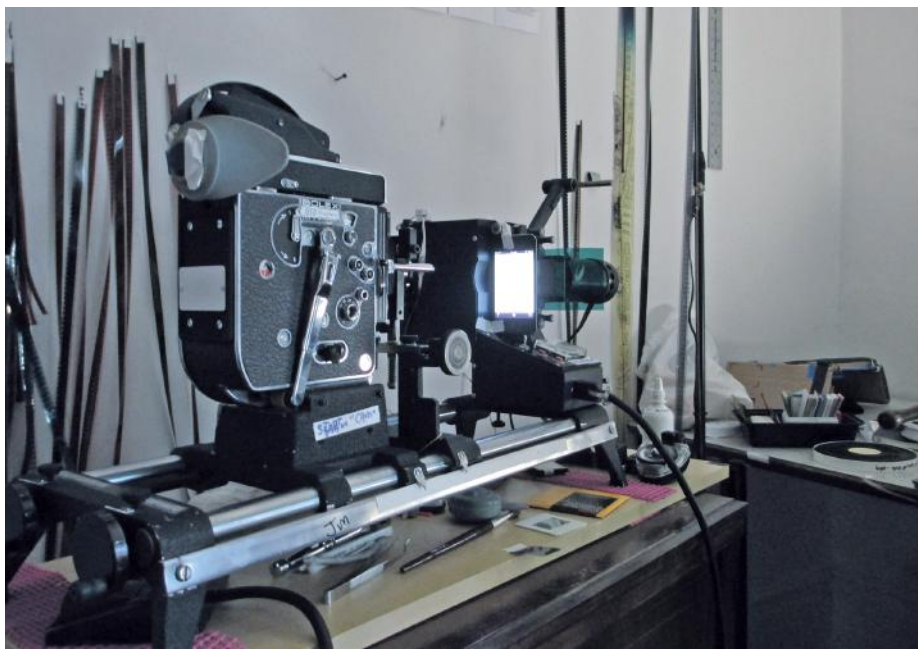

FIGURE 9.6
Julie's JK/iPhone title stand. Courtesy of the artist.

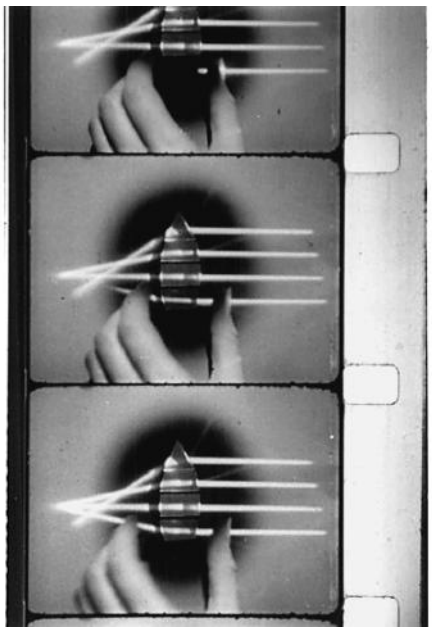

FIGURE 9.7
Film still of *If You Stand with Your Back to the Slowing of the Speed of Light in Water* (2004), Julie Murray. Courtesy of the artist.

(so that it was white letters on black) and set the screen brightness to maximum. The results she says kind of had a Super-8 feel, a bit indistinct at the edges with some screen texture that she liked.

KENNETH ZORAN CURWOOD—DIY OPTICAL PRINTER WITH AERIAL IMAGE PROJECTION

Sometimes, instead of a camera being pointed directly at the gate or projected image, there is a mirror involved, so as to bounce the image into a mirror and then onto a semi-opaque surface (like frosted glass or glass with a sheet of vellum over it). It can then be rephotographed or the filmmaker can rotoscope, drawing individual frames on paper or animation cels from live-action material. This was possible with the aerial image projection capability of some of the Oxberry animation stands. The system designed by Kenneth Zoran Curwood detailed below has rotoscope capability and it is worth incorporating into your design if you are thinking of doing hand-drawn animation.

The first time I ran into a home-made rotoscope device was in the mid-1990s. I was living in New York City and worked for a bit with filmmaker Jeff Scher as he was completing a bread commercial. In his studio I saw the first versions of home-made rotoscope devices. He had removed a gate, with an inching knob with the lens and feed and take-up spindles still attached, from an old 16mm projector and bolted it to the bottom of a coffee can that he had sawn a hole in to let light through. A goosenecked light was clamped above and you would maneuver it to shine enough (but not so much as to burn the film)

onto the film frame. This whole thing was attached to some sort of a frame, perhaps an old enlarger, although I seem to remember a 2 × 4 piece of wood was involved as well. You could move the coffee can rig closer or farther from the table to change the size of your frames. Instead of projecting the image from underneath, this rig projected it down, which left your legs encumbered but sometimes your hands got in the way of what you were drawing.

I don't know if that commercial was ever finished, but I remember I got a job offer to work on a feature for more money than I was making animating, so I bid Jeff adieu, but he continues to make some of the most breathtakingly beautiful rotoscoping I've ever seen. Incorporating watercolors, found objects, each frame different from the next, it is nothing short of stunning. In a brilliant marketing maneuver, once he has finished a film he puts the individual cels up for sale on his website, www.fezfilms.net. My first attempts at setting up a rotoscoping system in my home were inspired by his work. Interestingly, in the very small world that is the experimental film community, the person whose system I am describing next was also influenced by Jeff Scher.

Kenneth Zoran Curwood has made a very advanced optical printer with aerial image projection capabilities in both Super-8mm and 16mm. He details how the printer works in a video (Curwood). We also have this video on the companion website. The printer is built from pieces cobbled together from a variety of sources. There is a platen from a traditional animation table with Oxberry animation pegs. Like all animation tables, it has a cut-out area where a piece of glass is placed. Curwood has put a piece of vellum over it to create a screen that can be projected onto. The platen can also spin, move left and right (e/w) and up and down (n/s). There are also lamps to top-light animation on the platen should you wish to use it as a traditional animation stand and rephotograph paper cels.

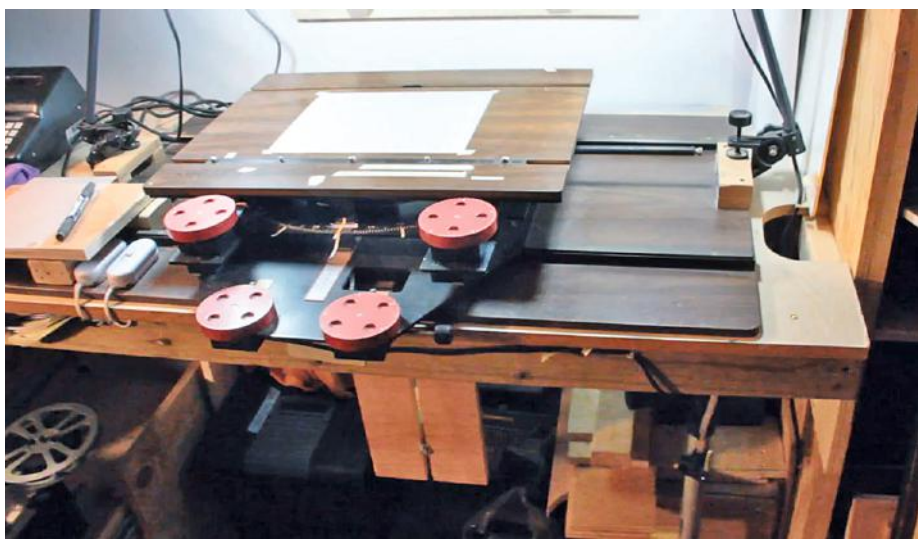

FIGURE 9.8
The platen of Curwood's animation stand. I can tell from the peg bars that it was part of an Oxberry rig at some point. The red dials control the e/w and n/w movement of the peg bars (upper) and top part of the platen (lower). The circular black piece directly under the platen allows for moving the whole top part in a circle.

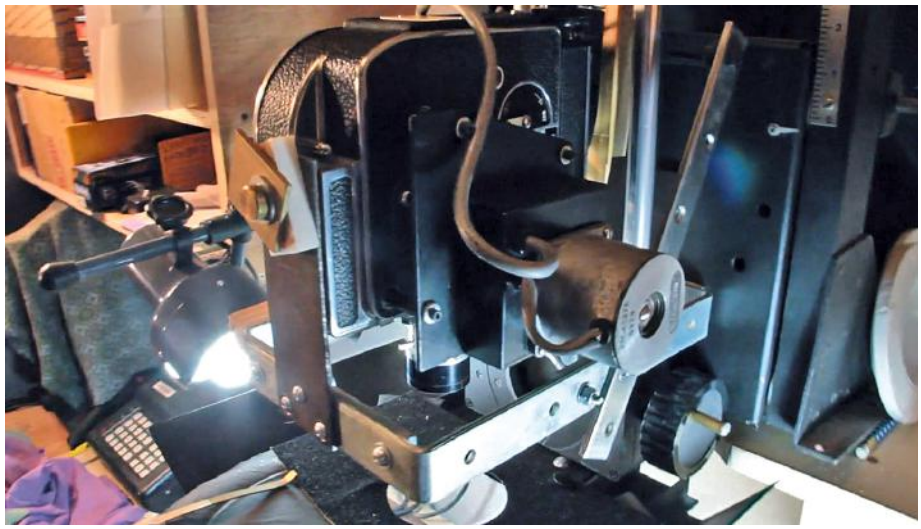

FIGURE 9.9
The Bolex has a motor attached that allows it to single frame.

The camera is a Bolex Rex 5. Curwood has designed an external shutter beneath the lens of the Bolex attached to a hood that goes around the lens and protects against reflections of the camera when the animation is top-lit. The external shutter can be used to create fades and other effects. The Bolex is controlled by an animation motor that can be controlled with a single-frame trigger from the tabletop and can also be hooked up to an Interval Time Sequence Motor (ITSM) built by Jaakko Kurhi. It is basically a time lapse motor but it allows for single framing.

The projectors slide into a shelf under the table and lay on their side so that the image is projected onto an optically clear mirror at a 45° angle to the

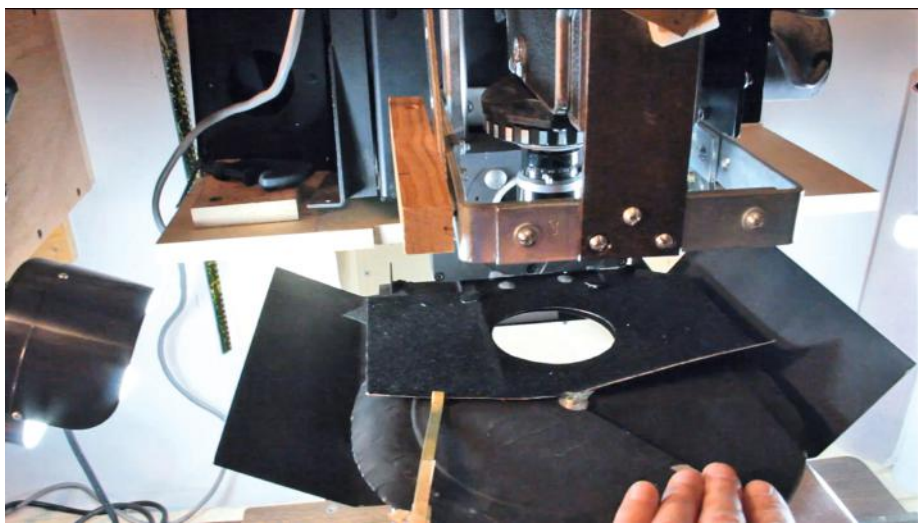

FIGURE 9.10
Beneath the Bolex is a shield to prevent light spill and reflection. Curwood has also built a shutter onto this to allow for certain special effects.

projector and the table. This mirror bounces the image up, without artifacts or distortion. The camera is secured to a transom taken from a darkroom enlarger so that the camera can move up and down in relationship to the platen. This allows Curwood to change the size of the image. The whole set-up is relatively small and can fit in a large closet, which is both convenient, seeing as he lives in a city and space is at a premium, and remarkable, given all that it can do and how large a similarly capable Oxberry animation stand would be.

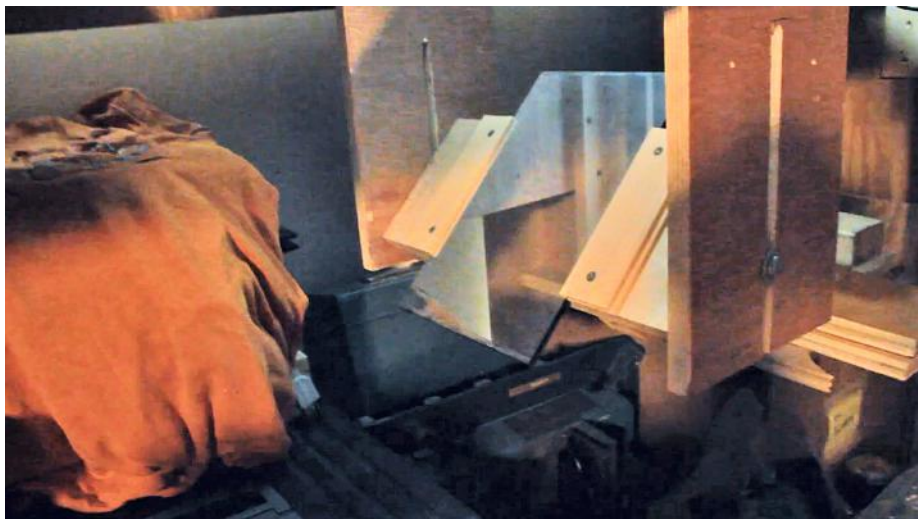

FIGURE 9.11
The mirror that bounces the image up to the projector.

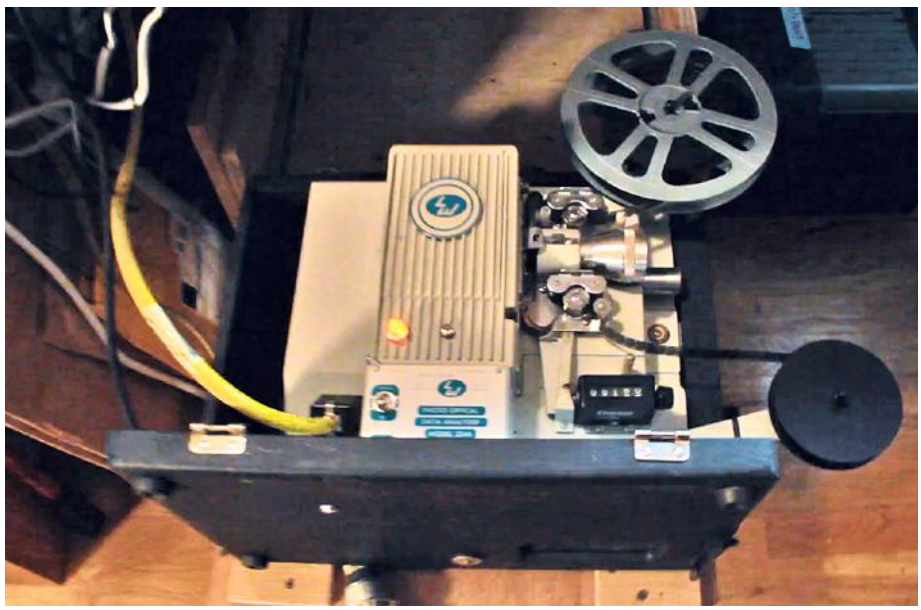

FIGURE 9.12
The projector is capable of single-frame advance that can be operated via remote (not pictured).

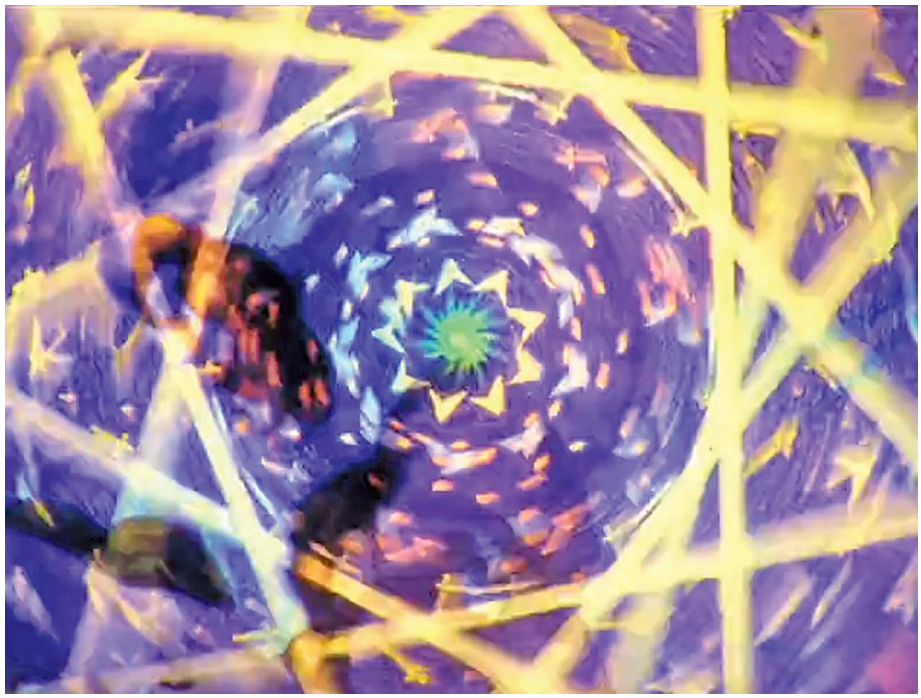

FIGURE 9.13
Film still from *A Young Colossus* by Kenneth Zoran Curwood. Inspired by the animations of the Whitney Brothers, this film has nine layers of superimpositions throughout. Courtesy of the artist.

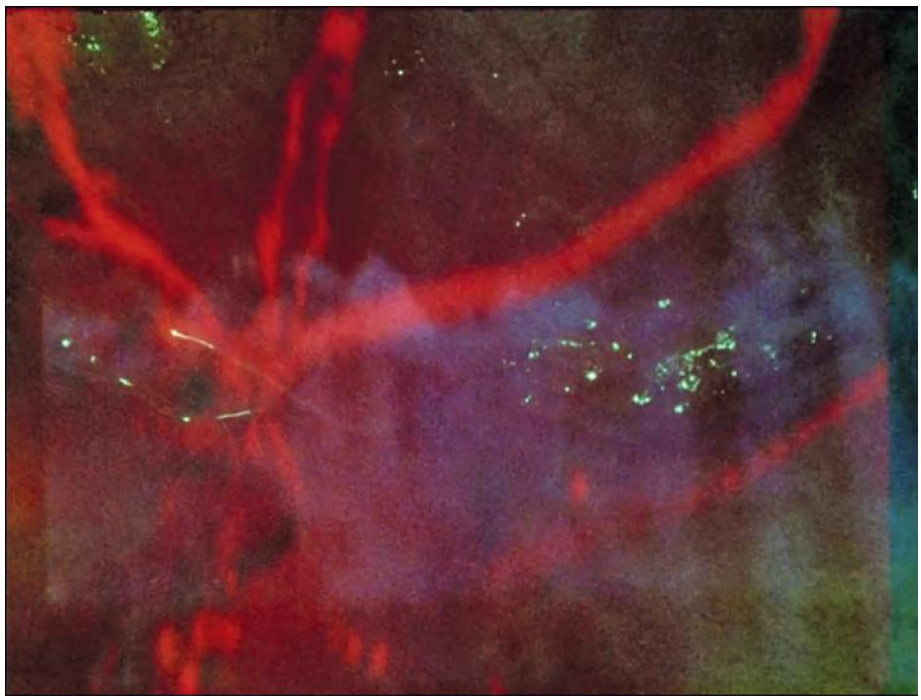

FIGURE 9.14
Still frame from Matt McWilliams's optically printed 16mm film *Produce*.

MATT MCWILLIAMS—DIY OPTICAL PRINTER + OPEN-SOURCE CODE

Matt McWilliams was one of my BFA students at Emerson College several years back and we've kept in touch on and off over the years. A few years back he told me he was making an optical printer that interfaced with a computer and of course I asked if he would be willing to be included in this book. Matt is part of a loose network of moving-image and sound artists in the greater Boston area. He is also really interested in open-source code. This all ties into his willingness to share his plans for his printer, the code and the parts to manufacture the parts for the motor on a 3D printer. He has made the work available online and provided links to the code. I have also provided the code as PDFs throughout the instructions. What follows is a brief interview with him alongside these instructions as I find it impossible to extricate Matt's motivations for making his own printer from his method of doing so. Enjoy!

INTERVIEW WITH MATT MCWILLIAMS + INSTRUCTIONS ON HOW TO MAKE A DIY OPTICAL PRINTER

Kathryn Ramey: What inspired you to make your own optical printer?

Matt McWilliams: I wanted to make an optical printer because I was disappointed by the limitations of the existing technologies for rephotographing 16mm. The JK line of printers are amazing machines, but their control systems employ dated interfaces that I thought could be updated. Rather than be limited to using a physical box that relies on an archaic programming language, I wanted to be able to use a desktop or tablet computer and software more like an audio sequencer to control the printer or even write scripts that could be stored, re-used and modified instantly rather than manually entered over and over.

I chose to modify existing projectors because I personally witnessed a lot of them being junked. When a motor or some other essential part of a projector dies people are often faced with a choice: throw it away or pay for an expensive restoration. It's been my goal to provide another option for projectors facing the trash heap. I don't really advocate cannibalizing working projectors, but if it's done from a perspective of learning and creating rather than destruction I don't see the harm.

The other issue with existing optical printers I wanted to address was cost. Professional systems are rather expensive and by making an open hardware printer I thought students or amateurs without a large budget for film could explore optical printing. The JK optical printers are proprietary and were designed by professional film technicians but a project started from scratch by an amateur engineer, I thought, could benefit from the collaborative design process that has built things like the RepRap project. [*Author's note*: RepRap is an open-source desktop 3D printer available online. "RepRap is humanity's first general-purpose self-replicating manufacturing machine." (http://reprap.org/)]

KR: Where did you source the instructions and parts? Specific URLs would be great.

MM: The electronics and the projector are the only parts I didn't fabricate for this project. I started with a Bell & Howell 16mm projector that needed a new motor. I stripped it down to nothing except the film gate and the gears necessary to move film through it.

Figure 9.15 is a comparable model but mine had more metal in the case. The core of the mechanical parts that drive this printer is the Arduino platform, a hobbyist microcontroller board for robotics and automation (see Figure 9.16).

To control the motor that drives the projector I used a "shield" for the Arduino. Shields are extension boards that plug into the Arduino and add capabilities with no soldering or wiring required. This I sourced from Adafruit, a company with an education-based approach to selling hobbyist electronics. Figure 9.17 is an example of a motor shield.

The motor driving the projector is a standard 12V DC motor that I tore out of an old paper printer. I kept some other elements from the printer to grab and drive the projector's belt and advance or reverse frames.

I used an IR emitter and receiver pair (www.sparkfun.com/products/241), and a small square of tinfoil to act as an optical encoder, which allows the printer to move exactly one frame at a time. A small custom-printed circuit board was made to handle this function but it is not a necessary part (see Figure 9.18).

FIGURE 9.15
Old Bell & Howell 16mm projector.

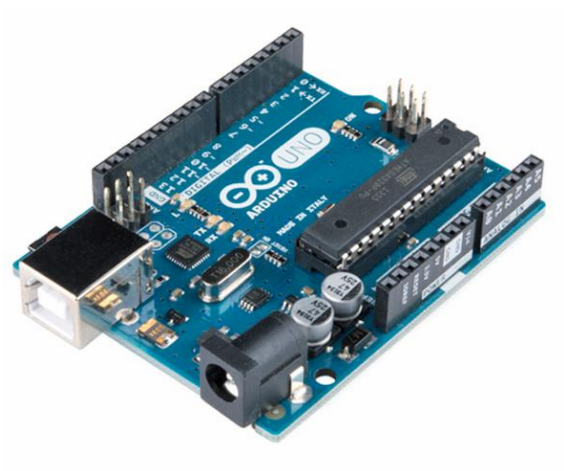

FIGURE 9.16
Arduino platform, a microcontroller board for robotics and animation.

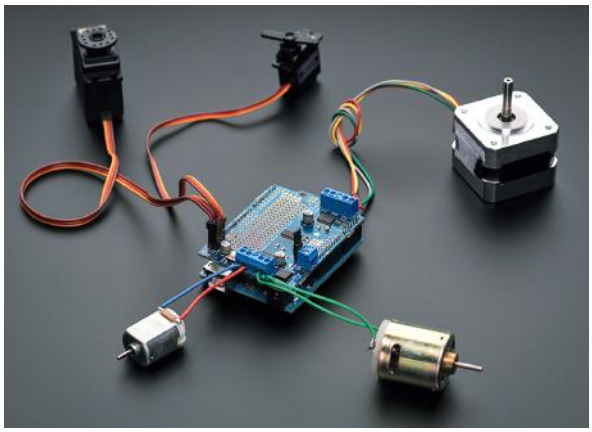

FIGURE 9.17
An Arduino shield board that plugs into the Arduino and adds capabilities without soldering or wiring.

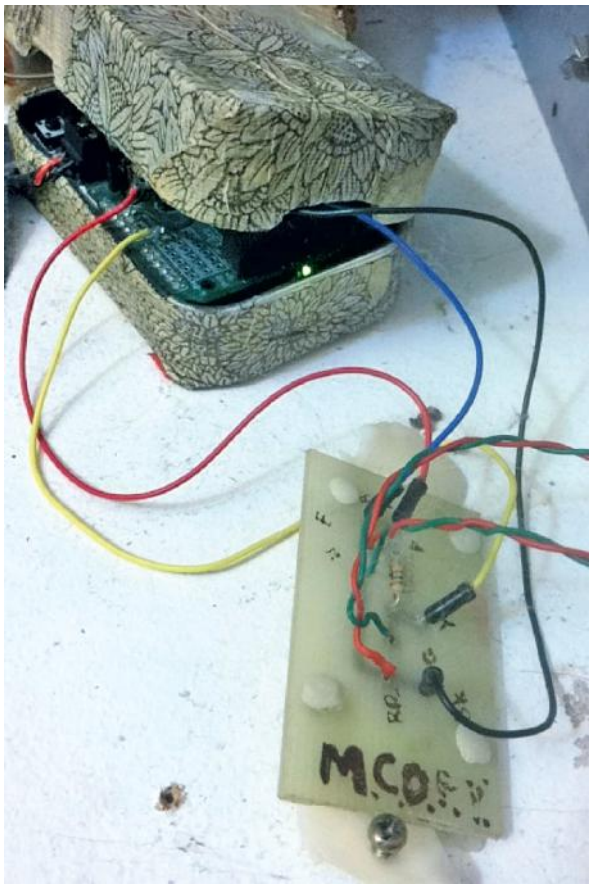

FIGURE 9.18
Small custom-printed circuit board.

Figure 9.19 (see end of chapter) is the Arduino code used to control the projector and can be accessed at: https://github.com/sixteenmillimeter/MCOPY_Firmware.

The optical printer uses a Bolex Rex 4 to rephotograph the film. Controlling the camera, originally, was a solenoid attached to a Bolex single-frame plunger. The solenoid was driven by another Arduino and a TIP120 transistor was used to handle the high voltage required. When attached to the same computer as the projector's electronics, the camera and projector can be synchronized to act in concert.

Figure 9.20 is a still frame of a solenoid-based camera controller working alone and can be seen on video at: https://vimeo.com/38163365.

Figure 9.21 (see end of chapter) is the code to control the camera and can be accessed at: https://github.com/sixteenmillimeter/INTVAL.

The light source for the printer is a 50V MR-16 halogen bulb that is directed through the 25mm lens that came with the projector. The lens acts as a

FIGURE 9.20
Still frame of the Bolex camera with single-frame motor.

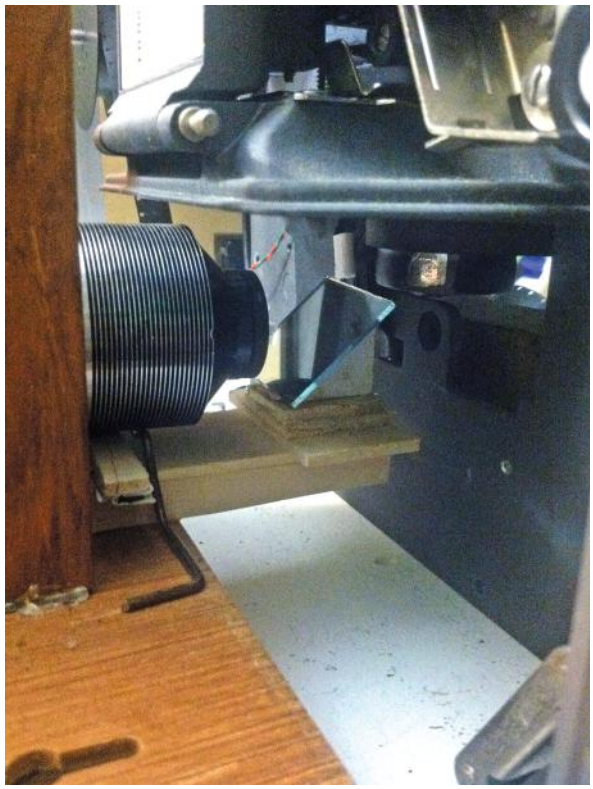

FIGURE 9.22
Light source for the optical printer made from a halogen bulb directed through a 25mm lens from the Bell & Howell projector.

condenser, which hits a piece of diffusion that is positioned behind the film gate of the projector (see Figure 9.22).

For the sequencing software, the original interface was done in processing. It is a simple grid-based interface that allows the user to visually arrange instructions for the printer to do, in order. This is a metaphor that carries through all versions of the software.

It's available from: https://github.com/sixteenmillimeter/mcopyFS (see also Figure 9.23 at the end of this chapter).

I wanted more flexibility so I re-wrote it in node.js, a popular web server technology that can be seen in Figure 9.27 (see end of chapter) or accessed at: https://github.com/sixteenmillimeter/mcopy.js.

This renewed approach allowed me to connect the camera and projector electronics into a desktop/server using USB, and to control the optical printer from a web page using any device on the same network. The mcopy.js source

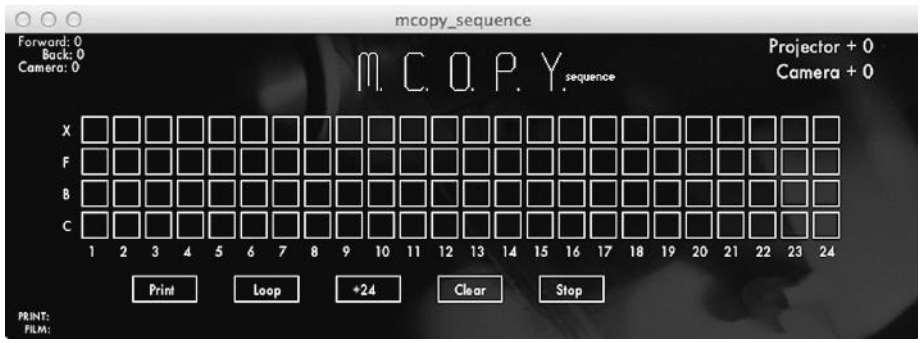

FIGURE 9.24
Grid-based interface that allows the user to visually arrange instructions for the printer to do.

FIGURE 9.25
Grid-based interface that allows the user to visually arrange instructions for the printer to do.

code is free, open source and extendable, and I hope it may appeal to others to do that or start a competing, higher-quality project.

The camera controller has already branched off into its own intervalometer project for Bolex 16mm cameras. The single-frame action originally used by the solenoid mechanism can be taxing on the Bolex spring motor over time, so I designed a side-mounted mechanism that uses the 1:1 shaft to advance and reverse the camera a single frame at a time while bypassing the motor completely.

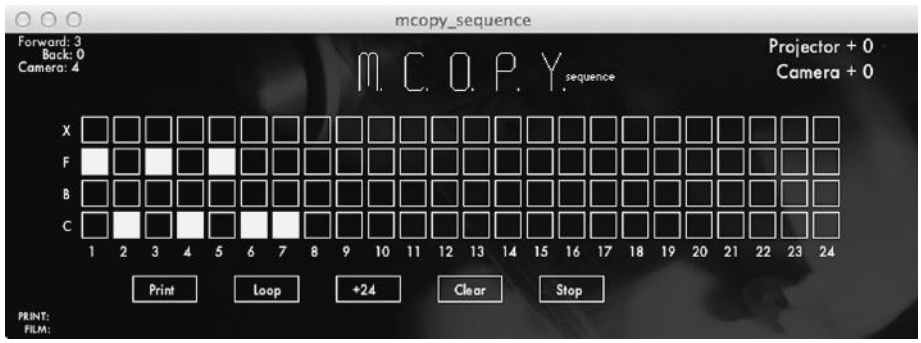

FIGURE 9.26
Grid-based interface for 18 to 24 step-up pattern.

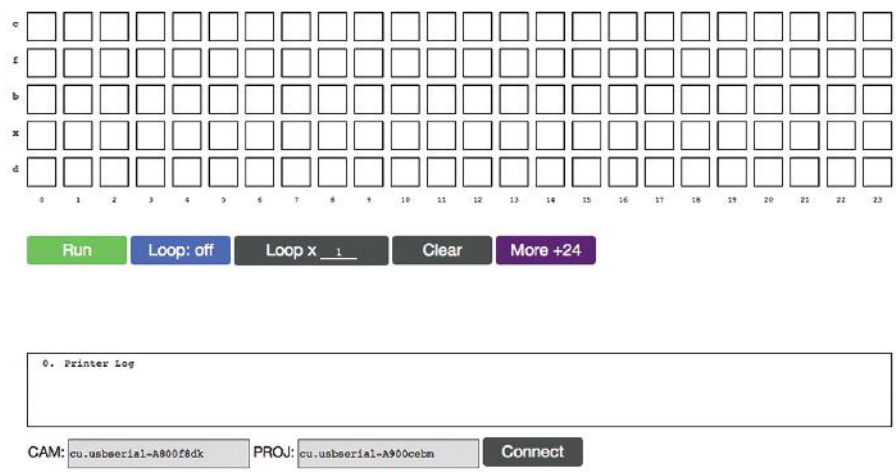

FIGURE 9.28
Desktop interface.

FIGURE 9.29
Tablet interface.

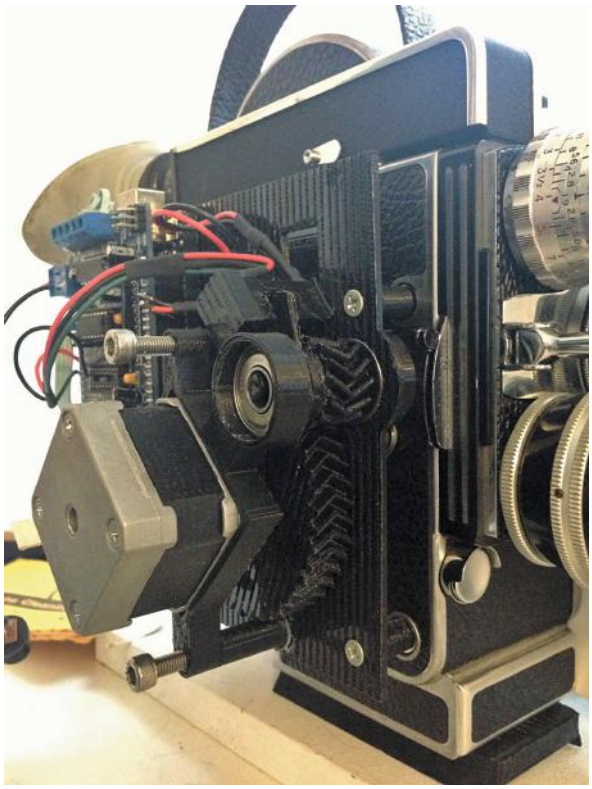

FIGURE 9.30
The time lapse motor connect to the Bolex.

FIGURE 9.32
The cover of the interval motor as machined by the 3D printer.

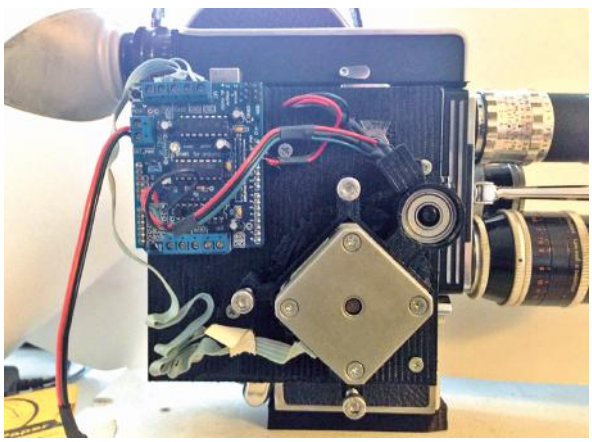

FIGURE 9.31
The time lapse motor connect to the Bolex.

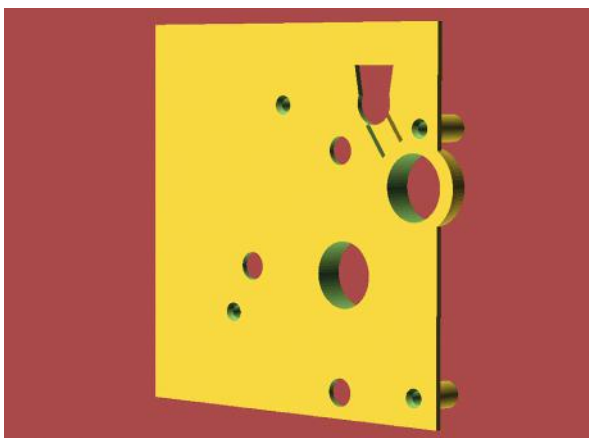

FIGURE 9.33
The render of the 3D piece before printing.

This was styled after the Tobin Time Lapse & Animation Motor. The motor the prototype uses is a 12V stepper motor that was also taken from a retired paper printer. The gears, boxes, supports and other parts of the motor were designed to be printed on a 3D printer. The motor can be seen in use in Figures 9.30 and 9.31 with examples of a 3D printed part in Figure 9.32 and the corresponding render in 9.33.

The entire project to date can be downloaded and 3D-printed from: www.thingiverse.com/thing:151944. The code repository for the entire project is represented in Figure 9.34 and is available online at: https://github.com/sixteenmillimeter/INTVALNext.

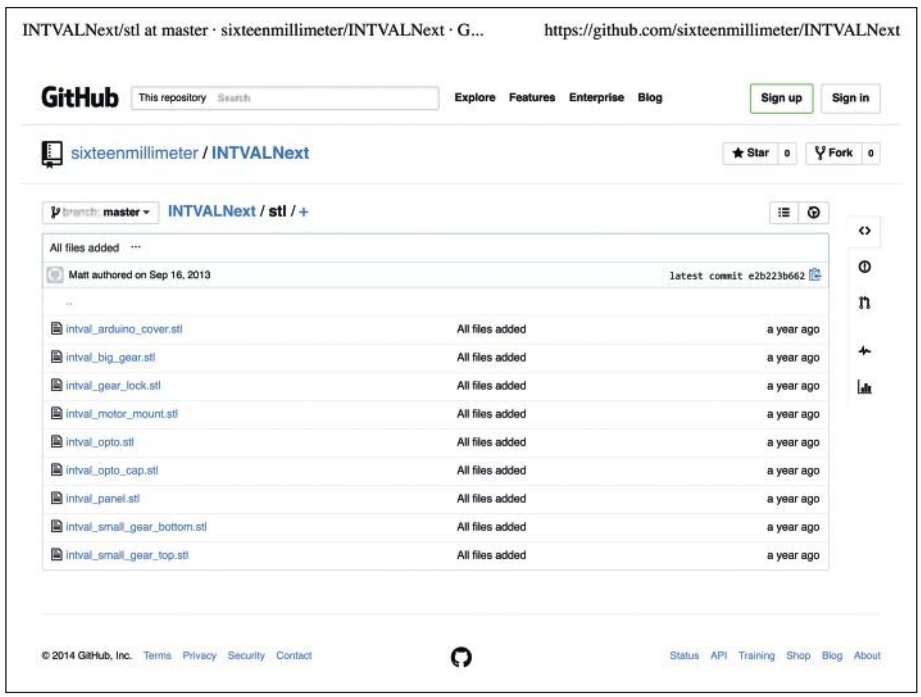

FIGURE 9.34
The code for the project.

KR: Are you a part of a community of filmmakers who you share your work with? How does this influence the kind and amount of work you make?

MM: There are two different communities I work with and for, which shape the way I approach filmmaking. One is a local group of Boston-area artists who show films in and around the city. Much of my work is extremely short form (2–3 minutes) and silent, so I seek out screenings that pair with musicians or experimental sound artists.

The other community I am a part of is the open-source, open-hardware community. I work on and participate with projects that I care about and that I use. I feel that film technology, particularly that relating to once-consumer-facing formats such as 16mm and Super-8, is a perfect candidate for the support of open-hardware creators. Movie film no longer has the corporate behemoths it once had catering to its needs and as a result many processes and technologies have been abandoned or neglected by the major advances in hobbyist electronics in the last few decades.

PETER ROSE—DIY + SUPER-COMPLICATED MATTE WORK

The final DIY optical printer guru is perhaps the most meaningful to me personally in this whole book. Peter Rose made the film *The Man Who Could not See Far Enough* (1986) and, when I saw it, I knew I wanted to be an experimental filmmaker. Years went by; I moved to New York City and then Philadelphia to pursue graduate school and through a strange twist of fate Jay Ruby, anthropologist and my mentor at Temple University, introduced me to Pete who then ended up hiring me as an adjunct teaching at the University of the Arts. Peter was and is brilliant and funny, and he was exceptionally generous with his knowledge and personal equipment. He let me use a homemade 100ft metal reel and tank he had made for hand-processing, and encouraged me to use the facilities at UArts that were in many ways superior to Temple for an experimental filmmaker. They had two Master Oxberries at that time and I shot a good deal of the animation and special effects for *ENDLESS PRESENT: BIOGRAPHY OF AN UNKNOWN FILMMAKER, a film by Cornealius Thistle* on those Oxberries. Eventually I also interviewed Peter for my dissertation and got to know much more about how he developed as an artist. There is an interview with him at the end of this chapter, but before that I want to go over his DIY optical printer and some of the work that he made with it, including the film *The Man Who Could not See Far Enough*.

PETER ROSE'S PRINTER—FROM AN EMAIL EXCHANGE WITH PETER

The printer had three elements. My father and I modified an old Kodak Analyst Projector so it could be triggered a frame at a time. An external motor and belt drove the frame advance and a small micro-switch signaled the motor to stop when the next frame came to rest. We removed the projector bulb and I mounted a slide projector and mirror outside the housing so the heat wouldn't melt the film. A small fan with cardboard funnel was used to cool the film (see Figure 9.36). A photocell mounted in front of the lens sent a signal to the synchronizing device to tell the camera to shoot a frame.

The camera, a Beaulieu, was mounted on a lathe bed with vertical columns affixed so it could move in two dimensions. I taped a razor blade to the edge

FIGURE 9.35
Peter Rose and his optical printer. Courtesy of the artist.

of the camera base and shone a flashlight down from above so the shadow of the razor blade fell on a piece of masking tape. Through trial and error I was able to make marks on the tape so that the resulting multiple images abutted each other nicely. Figures 9.35 and 9.39 show the set-up to some extent of Pete's optical printer.

The camera had a complicated mechanism attached to the sync shaft: a small blade with a mirror attached would rotate once each frame. There was a photocell

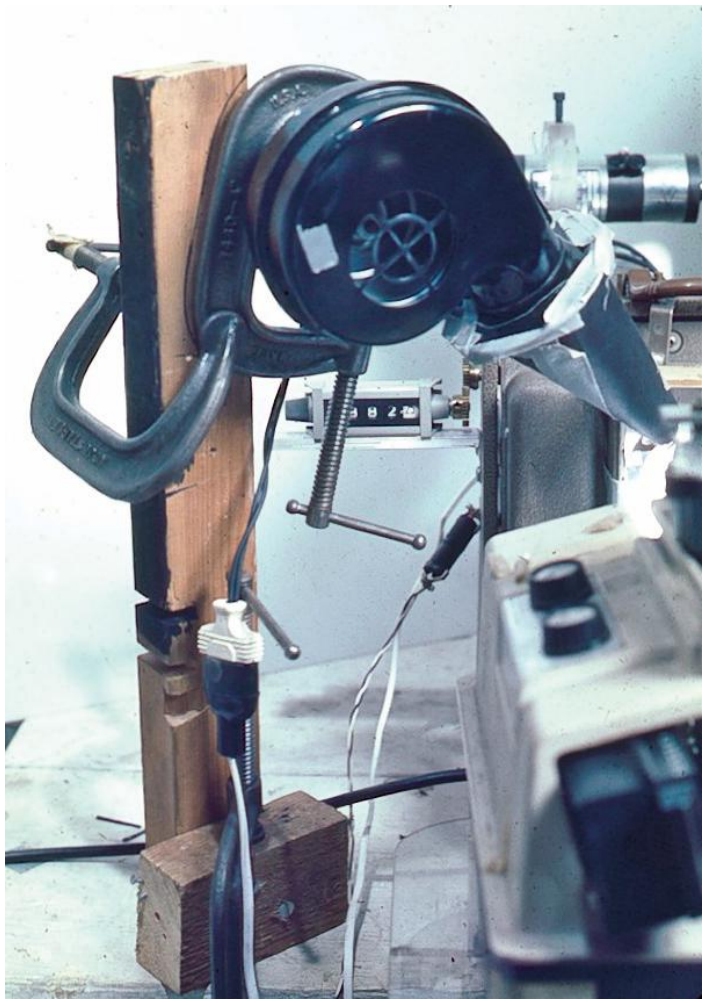

FIGURE 9.36
A small fan keeps the film cool. Courtesy of the artist.

and a small lightbulb likewise attached and arranged so that when the shutter was closed the light would be reflected from the mirror onto the photocell and a signal would be sent to the synchronizing device to stop the camera motor. Unfortunately I don't have close-ups of this.

The ensemble was controlled by the Synchronopticon—a hideously complicated affair of flipflops, capacitors, resistors, switches and wires that would count pulses from the projector and use these to trigger the camera. See Figure 9.38 for an image of the interior of this device. I could dial in any ratio:one camera frame per projector frame; every other frame; twice each frame; one extra frame every six projected frames; two skipped frames per three projected frames, etc.

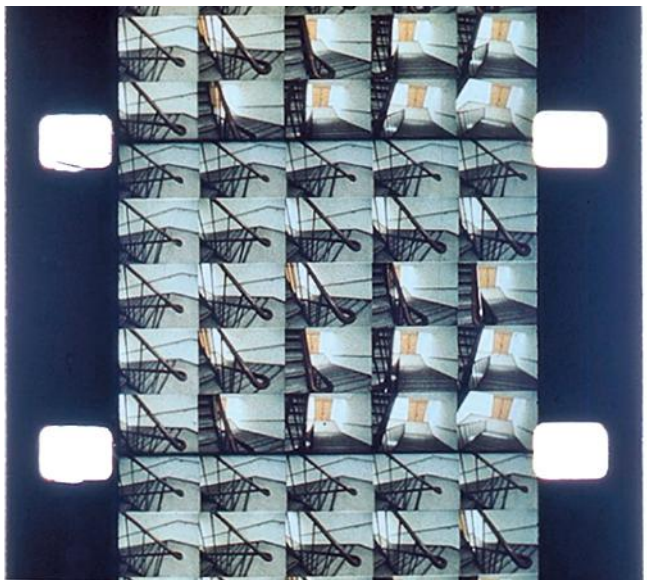

FIGURE 9.37
From the film *Analogies* by Peter Rose. Courtesy of the artist.

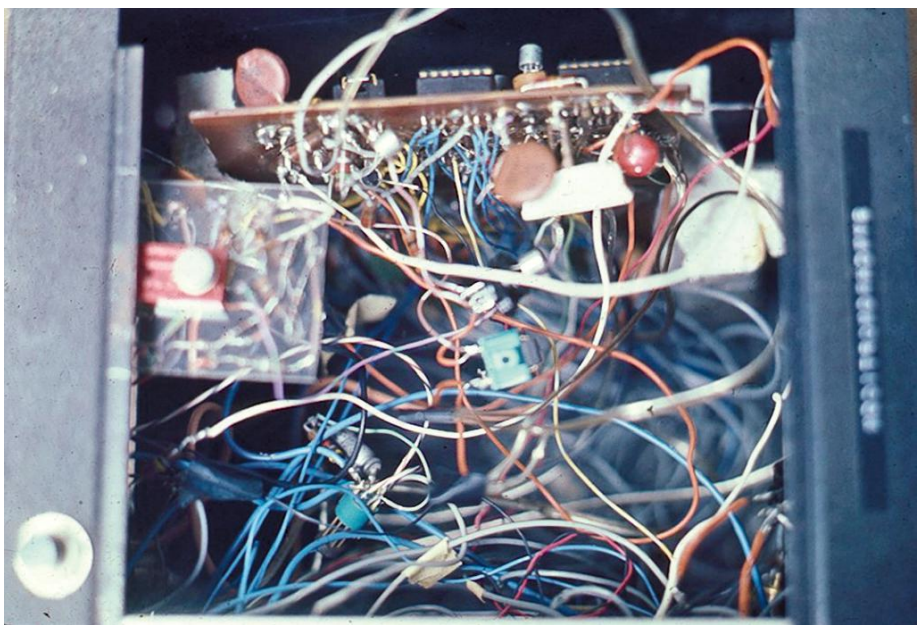

FIGURE 9.38
Interior of the Synchronopticon—the sequencer for Rose's optical printer. Courtesy of the artist.

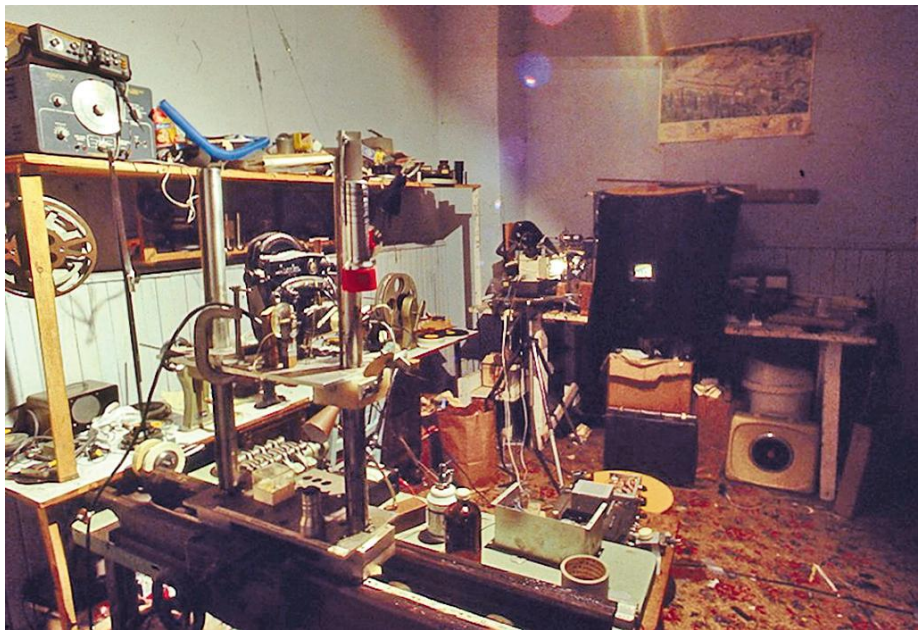

FIGURE 9.39
Rose's optical printer took up an entire room. The camera sat several feet opposite the projector, which was covered with black cloth but for the projected image. This is partly how he was able to get such crisp and precisely registered results.

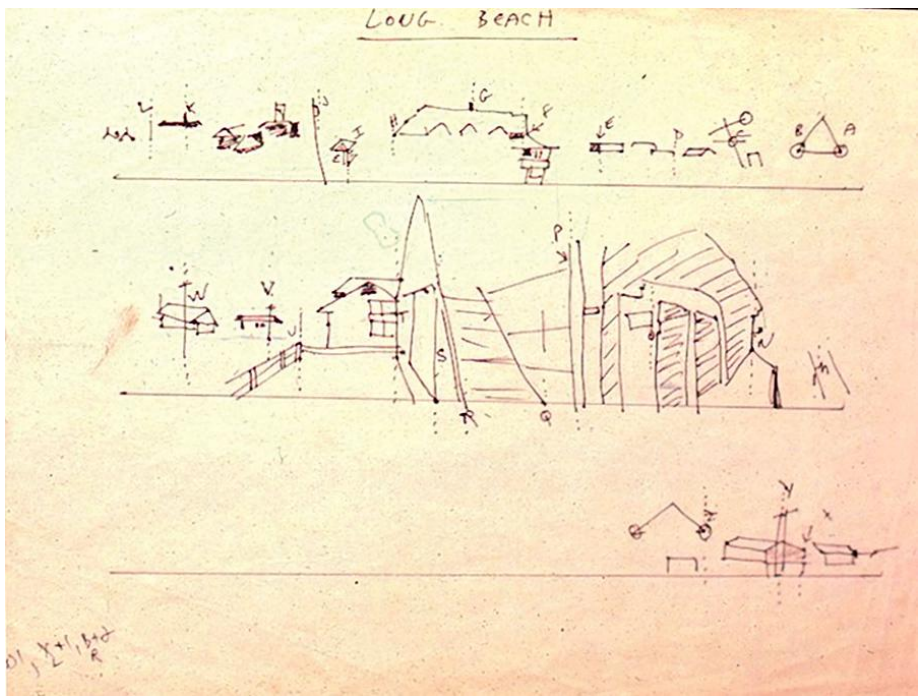

FIGURE 9.40
In order to achieve his elaborate motion effects *The Man Who Could not See Far Enough* it was necessary first to draw (visualize) the space of the effect (a scene from Long Beach seen here) and the camera movements for the different tracks (A–Z).

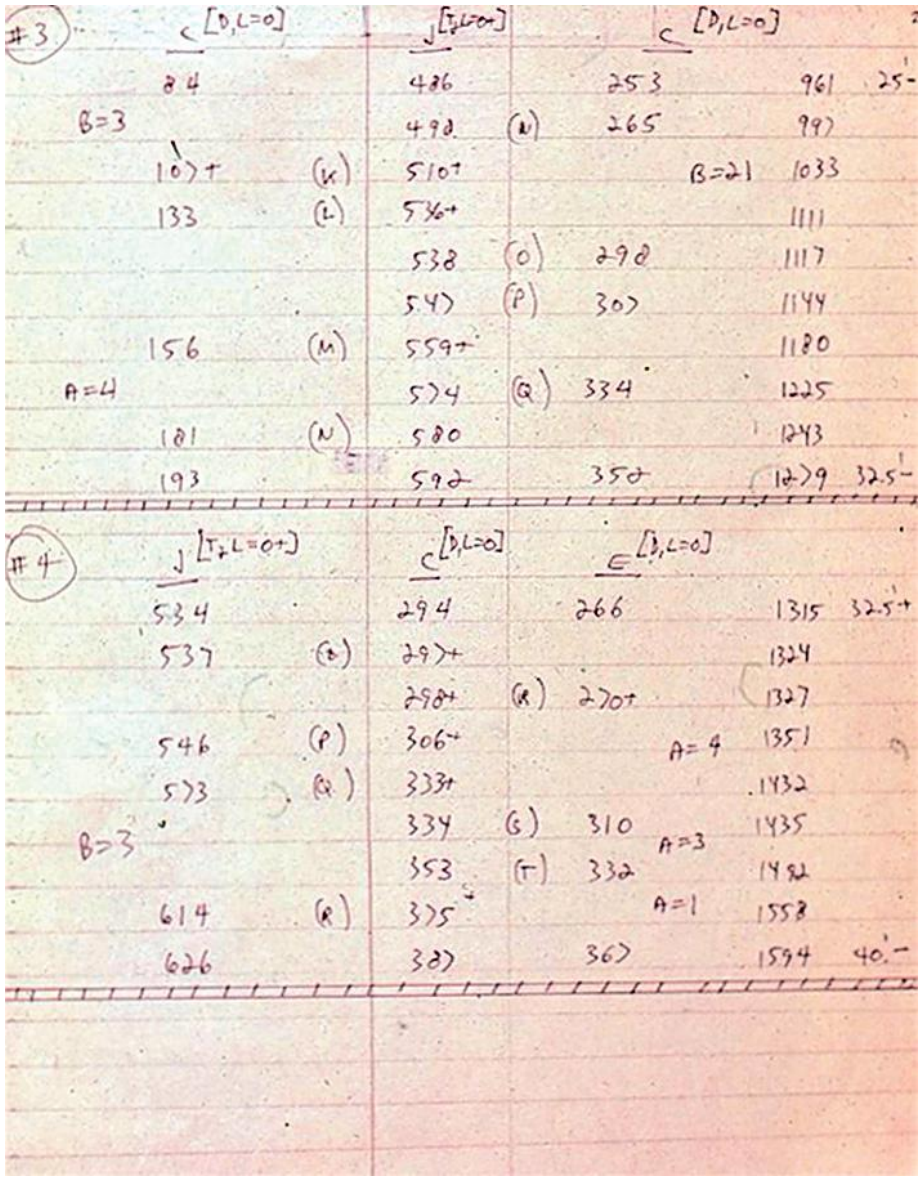

FIGURE 9.41
After shooting had been accomplished, the images needed to be rephotographed. In order to synchronize the images an elaborate camera plan was drawn up with specific frame counts for each strip of images. This is only one of several pages of notes.

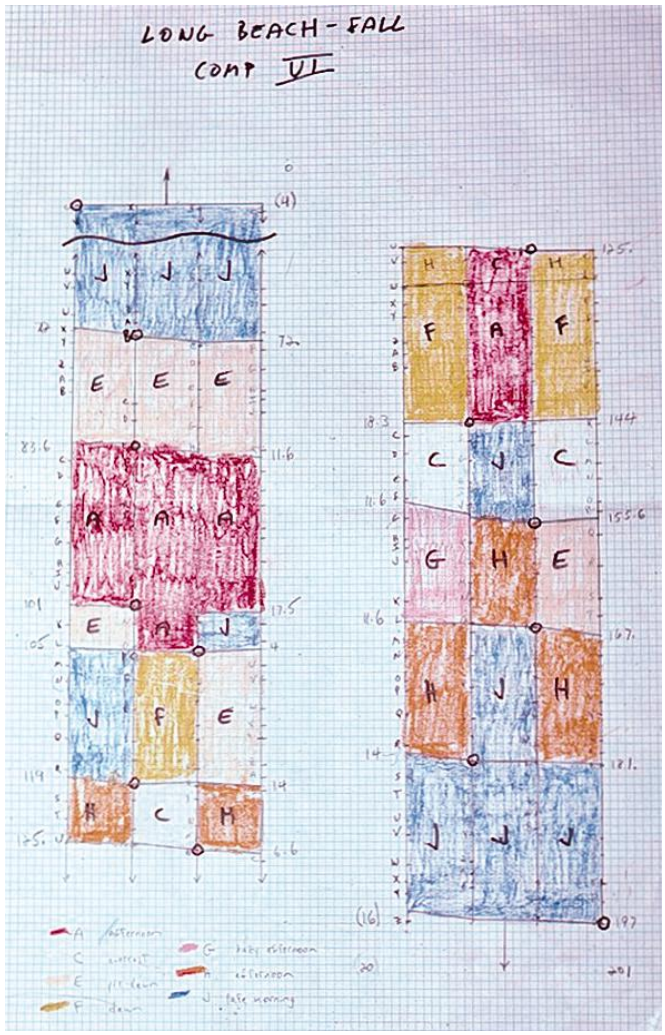

FIGURE 9.42
This information was also put onto a "map" so that Peter could determine where in the sequence shots began and ended.

INTERVIEW WITH PETER ROSE

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a new media practitioner, a shaman, a performer? How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

Peter Rose: I find it very difficult to categorize what I do and usually try, without success, to avoid answering altogether. "Filmmaker" comes with all sorts of

baggage—assumptions about mass audiences, scripting, collaboration, narrativity, economic positioning, etc.—that have no relevance to what I do. And "artist" comes with assumptions about galleries and another kind of positioning that are equally off the mark. "Avant-garde" is meaningless now. Likewise for "Experimental", "Media Artist", "Video Artist", *et al*. It's a problem and I have no pat answer here. An anecdote: I was once hitch-hiking through Greece and was picked up by an ancient Greek Orthodox priest and his younger acolyte. When I told them I was a filmmaker they asked what my films were like. I asked them if they had heard the sound of the goats' bells coming from further down the mountain and if they were aware of the smell of the flowers by the roadside. When they said "Yes" I paused . . . and said, "That's my film." I was thinking about some kind of conceptual synaesthesia but they seemed wonderfully satisfied with the answer. On a more personal, more interior level I suppose I see my process as akin to a kind of shamanic enterprise. I'm trying to wrest something transcendental from ordinary life, to "find some reprieve from the mercilessly forward movement of time and history". (This last is from a whole bank of musings you'll find at www.peterrosepicture.com/speech.php. I've put some of these below.) I explore the world around me—whether it's the suspension bridges of NYC, solar eclipses off the coast of Africa, the tunnels under the expressway, the levels of a parking garage,[1] or the inanities of the suburban landscape—and I try to transmute them into something mysterious and evocative.

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

PR: I started out in mathematics, but I quickly concluded that I had no aptitude for truly creative thought in the field. At around the same time, this would be 1965, I attended a series of lectures given by Slavko Vorkapich at the Museum of Modern Art where I learned that film had a structural dimension and that very much intrigued me. My early work, drawing as well on my fascination with ideas of higher dimension found in science fiction, headed off into a direction that would now be called "structural". I first tried superimposing multiple levels of imagery, in film, in the camera—and this led to *Incantation*. But there seemed to be limits to the process and so I sought a way to put twenty or so images into the same frame and this obliged me to design some kind of optical printer. My father, a highly esteemed and talented photographer and engineer working in the tradition of Muybridge, helped me to design an optical printer with which I was able to investigate what I called "diachronic motion" and that was where everything began. It was an immensely complicated, Rube Goldberg-like device that took us two years to design and I was very proud of it even if I had to hold my breath while using it for fear that somebody's vacuum cleaner three apartments away would trigger extra frames. Much of my work is very low-tech. I take pride in inventing the necessary technologies, whether it's a question of fashioning my own lenses to re-shape projected light

or of inventing a new language. It goes back to Muybridge and the Lumière brothers, inventors all.[2]

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

PR: My ideas came first from questions about perception, time and cinematic structure, but those exfoliated into questions about language, light and space that were informed by readings in science, the sociology of language, philosophy and literature. Typically, certain unresolved issues in one work would lead to the next—some idea that was half-baked at one time would unfold into a new work within which there'd be the seeds for the next. I've always had a concern with the material/technical properties of media: the single-frame nature of film, the luminosity of video, the materiality of sound, the plasticity of digitalia. But I've also felt an obligation to embed this concern within a larger, more lyrical enterprise. So the work is, hopefully, about more than media-specificity. It is, by turns, comic, political, poetic, metaphysical. On the subject of agendas from a speech at the William Penn Foundation:

> I think it's always a bit foolish to talk about what I'm doing. You have to realize that I don't really have an agenda, and that the pseudo-agendas I create for myself usually evaporate before the project is over. That is, the internal dialogues which I conduct with myself while making the work have no credibility for me two years later. They are simply scaffolds that I use to construct the work and which fold away after the project's been launched.

That being said, I can affirm an interest in simultaneity, in paradox, in complexity; an interest in teaching an audience the rules of certain games and in exploring, with that audience, the implications of those rules. I'm interested in setting up these systems—visual, conceptual, linguistic—whose laws are known but which somehow get out of hand, that have unexpected implications —a life of their own—and that affirm, however metaphorically, the existence of something outside of a reductive materialism, that affirm the spirit.

I'm an escape artist. I aspire to travel in the fifth dimension, to speak unknown languages, to discover the next stage in the evolution of thought. I construct structural parables that allude to the possibility of there being more to the universe than our smug explanations permit. I try to subvert our tendency to deconstruct everything while, at the same time, self-deconstructing my own efforts. I throw a lot of words and ideas and images around and hope that some of them will stick together, and then I try to take credit for the consequences.

I think of myself as a poet—in the Maya Deren sense of the word—trying to find that vertical dimension to experience that serves as a reprieve from the mercilessly forward narrative movement of time and history.

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

PR: My early work, in film, was shown at festivals, in museums, classrooms, etc. because that was the only way the work could be shown. There were a few distributors, but much of the thing was driven by word-of-mouth and the rare review. Canyon and the FMC were great, as were a few others who didn't last as long. I often traveled with my work and that was quite rewarding. Video promised much easier distribution and exhibition (the quality of video sound was what initially drew me to the medium), but the scene was controlled by a handful of art curators whose tastes did not seem to extend to my work, so once again it was word-of-mouth. There were a few public broadcast stations that were open to experimental work and the festivals were, again, quite helpful, but it was a highly contingent process. The digital revolution changed a good bit of this. Until recently I had pretty much given up the idea of making anything off of my work and so decided to put much of it up on the web. (I'm about to sign with Fandor and will put up the film work there.) I put all my language work up at Ubu (www.ubu.com/film/rose.html) and a good bit of my other work is up at Vimeo and, to a lesser extent, at YouTube. I now find that, while the initial assumption was that one's work would always be seen on a large screen, my working process, mediated as it is by my small 17" monitor and given that it will be most accessible through the web, has led me to make work best seen, more intimately, on a similar kind of screen. So current exhibition and production media have definitely informed the nature of the work. Lately, too, I've made a number of video installation pieces[3] and these oblige a very different sense of time. They tend to be very site-specific, too, so distribution is out of the question. But there is an engaging theatricality to installation that is quite attractive.

KR: And finally, your chapter is called "Optical Printing: DIY". Please elaborate how you came to such an activity? Were you part of a community of makers (either locally or internationally) who communicate with each other about their work and got together either virtually or physically to discuss/show/celebrate? Where? When? How? What happened?

PR: And now for optical printing: many years ago there was an informal group of optical printerers and animation artists who would get together in NYC every so often to chat and to show each other work. Many of its members went on to make significant work: Sky David, Kathy Rose, Anita Thatcher, Paul Glabicki, and others. George Griffin was one amongst us and he put together a marvelous little book called *Frames: A Selection of Drawings and Statements by Independent American Animators*. It's a wonderful embodiment of the kind of energy circulating in the group. Since then, of course, such acute attentiveness to structural possibilities has migrated to the digital realm and there are now countless communities of interest.

KR: How did your work with your home-made optical printer move into other kinds of work? Other kinds of tools?

PR: Since then my interest in home-built technology has led me to play with a tactic I call "transfalumination". I found a way to project a sheet of light into space, rather than the usual linear beam, and have been exploring a method of drawing, or, more accurately, feeling with light. This is embodied in *Studies in Transfalumination* and in *The Indeserian Tablets*, both of which are on the web.[4,5] Most recently I've been enthralled by the whole world of 3D video. I've been slowly researching the technology and aesthetics, which are actually remarkably alien. I've built my own rigs and have discovered spectacular ways of compositing the images so as to suggest a kind of six-dimensional vision. This is a natural elaboration of my initial interest in higher dimensions and in other structures of vision and it promises to be quite productive.

References

1. *Odysseus in Ithaca*, https://vimeo.com/6931757.
2. *Analogies: Studies in the Movement of Time* (excerpt), https://vimeo.com/48773161; *Metalogue*, https://vimeo.com/6992030.
3. *Pneumenon*, https://vimeo.com/4186420.
4. *Studies in Transfalumination*, https://vimeo.com/6992175.
5. *The Indeserian Tablets*, https://vimeo.com/user1592855/albums.

Your assignment from Peter Rose

1. Take a long straw—non-transparent.
2. Go outdoors on a sunny day.
3. Stand it upright on a busy piece of ground with a lot of leaf clutter.
4. Notice that when the straw is stationary you can't easily see the straw's shadow; but when you move it, the shadow is now clearly visible.

NOTE FROM PETER ROSE: What's of interest is that usually the shadow gets so broken up by the terrain that you can't easily spot it, but as soon as you move it your kinetic perception kicks in and it's immediately visible. Something about complex parallel processing in the visual cortex. . . .

FIGURE 9.19 (1)
(*Facing page*) Arduino code used to control the projector. Also available at: https://github.com/sixteenmillimeter/MCOPY_Firmware.

Code for Matt McWilliam's printer

MCOPY_Firmware/MCOPY_Arduino_2_0_blink.pde at master · sixteenmillimeter/MCOPY_Firmware · GitHub

branch: **master** MCOPY_Firmware / **MCOPY_Arduino_2_0_blink.pde**

sixteenmillimeter July 19, 2011 Both modes

1 contributor

175 lines (151 sloc) | 3.215 kb

Raw Blame History

```
1   //Blink
2
3   #include <AFMotor.h>
4   #include <Servo.h>
5   AF_DCMotor motor(1, MOTOR12_2KHZ);
6   //IR VARIABLE
7   int irVal = 1000;
8   int ir = 13;
9   int trip = 0;
10  int t = 0;
11
12  //BLINK MODE - 4 LEDS representing the 4 functions
13
14  //x
15  int blink0 = 13;
16  //c
17  int blink1 = 12;
18  //f
19  int blink2 = 11;
20  //b
21  int blink3 = 10;
22
23  //
24
25  int incomingByte = 0;
26  Servo myservo;
27
28
29  void setup(){
30
31    pinMode(ir, OUTPUT);
32
33    motor.setSpeed(200);
34    Serial.begin(9600);
35    myservo.attach(9);
36
37    Serial.flush();
38    Serial.println("M,C,O,P,Y,");
39    Serial.println("Build: 'Balla'");
40    Serial.println(" ");
41
42    //BLINK CODE
43    pinMode(blink0, OUTPUT);
44    pinMode(blink1, OUTPUT);
45    pinMode(blink2, OUTPUT);
46    pinMode(blink3, OUTPUT);
47    digitalWrite(blink0, LOW);
48    digitalWrite(blink1, LOW);
```

```
  digitalWrite(blink2, LOW);
  digitalWrite(blink3, LOW);
  //
}
void loop(){
  if (Serial.available() > 0){
    incomingByte = Serial.read();
  }
  if(incomingByte == 'f'){

    Serial.println(incomingByte, BYTE);
    /* TAKE OUT FOR BLINK MODE
    motor.setSpeed(225);
    motor.run(FORWARD);
    delay(200);
    digitalWrite(ir, HIGH);
    t = analogRead(trip);

    while (t > irVal){
    delay(20);
    t = analogRead(trip);
    //Serial.println(t);
    }
      motor.run(RELEASE);
      digitalWrite(ir, LOW);
      incomingByte = 0;
      delay(500);
      motor.setSpeed(200);
      */

      //BLINK CODE
      for(int i=0;i<3;i++){
      delay(165);
      digitalWrite(blink2, HIGH);
      delay(165);
      digitalWrite(blink2, LOW);
      }

  }

  if(incomingByte == 'b'){
    Serial.println(incomingByte, BYTE);
    /* TAKE OUT FOR BLINK MODE
    motor.setSpeed(225);
    motor.run(BACKWARD);
    delay(200);
    digitalWrite(ir, HIGH);
    t = analogRead(trip);

    while (t > irVal){
    delay(20);
    t = analogRead(trip);
    }
      motor.run(RELEASE);
      digitalWrite(ir, LOW);
      incomingByte = 0;
      delay(500);
      */

    //BLINK CODE
      for(int i=0;i<4;i++){
        delay(125);
```

FIGURE 9.19 (2)

```
        digitalWrite(blink3, HIGH);
        delay(125);
        digitalWrite(blink3, LOW);
      }
  }
  if(incomingByte == 'c'){
    Serial.println(incomingByte, BYTE);

  /* TAKE OUT FOR BLINK MODE
  delay(500);
  myservo.write(0);
  delay(1000);
  myservo.write(180);
  incomingByte = 0;
  */

    //BLINK CODE
    for(int i=0;i<2;i++){
      delay(250);
      digitalWrite(blink0, HIGH);
      delay(250);
      digitalWrite(blink0, LOW);
      }
  }
  if(incomingByte == 'x'){
    Serial.println(incomingByte, BYTE);
  /* TAKE OUT FOR BLINK MODE
    motor.run(FORWARD);
    delay(200);
    motor.run(RELEASE);

    delay(500);
    myservo.write(0);
    delay(1000);
    myservo.write(180);
    delay(500);
    motor.run(BACKWARD);
    delay(350);
    motor.run(RELEASE);
    motor.run(FORWARD);
    digitalWrite(ir, HIGH);
    t = analogRead(trip);
    while (t > irVal)
    {
      delay(10);
      t = analogRead(trip);
    }
    motor.run(RELEASE);
    digitalWrite(ir, LOW);
    incomingByte = 0;
    delay(500);
    */

  //BLINK CODE
    for(int i=0;i<2;i++){
      delay(250);
      digitalWrite(blink1, HIGH);
      delay(250);
      digitalWrite(blink1, LOW);
```

FIGURE 9.19 (3)

```
170       blinker(deBug,length);
171       Serial.print("Camera[");


172       Serial.print(length);
173       Serial.print("] : ");
174       Serial.println(speeds[length]);
175       conc++;
176     }
177     delay(5);
178   }
179   //Print 1
180   void bD(){
181     if(donc<1){
182       ovrl++;
183       ease(camPin,speeds[length]);
184       blinker(deBug,length);
185       donc++;
186     }
187     delay(400);
188
189   }
190
191
192   void blinker(int pin, int times){
193     for(int i=0; i<times; i++){
194       digitalWrite(pin,HIGH);
195       delay(32);
196       digitalWrite(pin,LOW);
197           delay(200);
198     }
199   }
200
201   //for 1-505;
202   int ramp(int x) {
203    float a = 1/1000;
204    float b = 2.0;
205    int limit = floor(pow(a*x, 2));
206    if(limit > 255) {
207       limit = 255;
208    }
209    return limit;
210   }
211
212   //BETTER RAMP FUNCTION FOR STABILITY
```

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FIGURE 9.19 (4)

INTVAL/INTVAL.PDE at master · sixteenmillimeter/INTVAL · GitHub

sixteenmillimeter / **INTVAL**

Star 0 Fork 0

branch: **master** **INTVAL** / **INTVAL.PDE**

Matt October 13, 2012 Simplified output of timing for mcopy integration

1 contributor

213 lines (181 sloc) | 3.831 kb

Raw Blame History

```
1   //INTVAL V 1.0
2   #include <Button.h>
3
4   /*
5   WHAT TO WIRE:
6   A0 - Button D - Shoot once
7     -serial 0
8   A1 - Button C - Camera increase (x2)
9     -serial 1
10  A2 - Button B - Delay increase (+1sec)
11    -serial 2
12  A3 - Button A - ON/OFF loop
13    -serial 3
14  */
15
16  int butA=17; int butB=16; int butC=15; int butD=14;
17
18  long aonc = 0;long bonc = 0;long conc = 0;long donc = 0;
19
20  boolean swtch = false;
21
22  unsigned long timeI, timeO;
23
24  int camPin = 10;//PWM!!!!!!
25  int deBug = 13;
26  int length = 0;
27  int ovrl = 0;
28  int dela = 0;
29  int incomingByte = 0;
30
31  //                      1/60 1/30 1/15 1/8 1/4 1/2  1s   2    4     8   16    30     1m     2m     4m     8m      15m
    30m
32  //                         0   1   2   3    4   5   6    7    8     9   10    11     12     13     14     15      16
    17
33  unsigned long speeds[] = {16, 32,  64, 128,
    256,512,1024,2056,4000,8000,16000,30000,60000,120000,240000,480000,900000,1800000};
34
35  Button buttonA = Button(butA,PULLUP);
36  Button buttonB = Button(butB,PULLUP);
37  Button buttonC = Button(butC,PULLUP);
38  Button buttonD = Button(butD,PULLUP);
39
40  void setup(){
```

FIGURE 9.21 (1)

```
  pinMode(camPin,OUTPUT);
  pinMode(deBug,OUTPUT);

  Serial.begin(9600);
  Serial.flush();
  Serial.println("Connected");
  delay(150);

  for(int o=0;o<18;o++)
  {
    Serial.print(o);
    Serial.print(": ");
    Serial.println(speeds[o]);
  }
}

void loop(){
  aonc = 0; bonc = 0; conc = 0; donc = 0;
   if(Serial.available()>0){
      incomingByte = Serial.read();
   }
   if(incomingByte==51){  //3
     bD();
     incomingByte = 0;
   }
      if(incomingByte==50){//2
     bC(1);
     incomingByte = 0;
   }
      if(incomingByte==49){//1
     bB(1);
     incomingByte = 0;
   }
      if(incomingByte==48){//0
     bA();
     incomingByte = 0;
   }









  while(buttonA.isPressed()){ //ON OFF Toggle Button
    bA();
  }
  digitalWrite(deBug,LOW);

  while(buttonB.isPressed()){ //Delay increase
    bB(1);
    //bB(-1);
  }
  digitalWrite(deBug,LOW);

  while(buttonC.isPressed()){ //Camera increase
    bC(1);
    //bC(-1);
  }
  digitalWrite(deBug,LOW);

  while(buttonD.isPressed()){ //Shoot once
    bD();
  }
```

FIGURE 9.21 (2)

```
  //serial ifs


  digitalWrite(deBug,LOW);
  if(swtch==true){
    ovrl++;
    ease(camPin,speeds[length]);
    delay(dela*1000);
  }

}

void ease(int pin, int L){
  int steps = 255;
   unsigned long then = millis();
  for(int i=0;i<256;i+=255/steps){
    analogWrite(pin,i);
    delay(1);
  }
  analogWrite(pin,255);
  delay(L);
  for(int i=255;i>-1;i-=255/steps){
    analogWrite(pin,i);
    delay(1);
  }

  Serial.print("cam:");
  Serial.println(millis()-then);

}
// ON/OFF
void bA(){
  digitalWrite(deBug,HIGH);
    if(aonc<1)
    {
      if(!swtch)
      {
        swtch=true;
        Serial.println("ON");
        blinker(deBug,2);
      } else{
        swtch=false;
        Serial.println("OFF");
        blinker(deBug,3);
      }
      aonc++;
    }
    delay(5);
}
// delay manipulation
void bB(int change){
  if(bonc<1){
    dela += change;
    blinker(deBug,dela);
    Serial.print("Delay: ");
    Serial.println(dela*1000);
    bonc++;
  }
  delay(5);
}
//
void bC(int change){
```

FIGURE 9.21 (3)

mcopyFS/mcopy_film_sequencer.pde at master · sixteenmillimeter/mcopyFS · GitHub

branch: master ▾ mcopyFS / mcopy_film_sequencer.pde

wholegrain June 22, 2011 First Version

1 contributor

330 lines (302 sloc) | 5.913 kb Raw Blame History

```
1   import processing.serial.*;
2   Serial mcopy;
3
4   int dpi = 112;
5   int dlay = 1300;
6
7   int[] w = new int[15000];
8   String[] wS = new String[15000];
9   int rCount = 0;
10  int[] film = new int[15000];
11  String[] filmS = new String[15000];
12
13  int place = 0;
14  int[] counter = new int[5];
15  int mX = 0;
16  int mX2 = 0;
17  int mstore = 0;
18  int mstore2 = 0;
19  int printCAM = 0;
20  int printPRO = 0;
21
22  int lng = 24;
23
24  float mm = float(dpi) / 25.4;
25  float a = 16.0 * mm;
26  float b = 10.7 * mm;
27  float c = 7.57 * mm;
28  float d = 0.8 * mm;
29  float e = 1.2 * mm;
30  float f = 1.7 * mm;
31
32  PFont font;
33
34  void setup() {
35    size(int(26*c), int(148*mm));
36    smooth();
37    background(40);
38    font = createFont("HiraKakuStdN-W8-48.vlw", 48);
39    for (int z=0;z<w.length;z++) {
40      w[z] = 4;
41      wS[z]=" ";
42      film[z] = 4;
43      filmS[z]=" ";
44    }
45    for (int p=0;p<4;p++) {
46      counter[p] = 0;
47    }
48    String loader[] = loadStrings("save.txt");
49    int loadcount = 0;
50    for (int t=0;t<loader.length;t++) {
51      w[t] = int(loader[t]);
52      counter[w[t]]++;
53      if (w[t]==2) {
54        printPRO++;
55      }
```

FIGURE 9.23 (1)
This is a simple grid-based interface that allows the user to visually arrange instructions for the printer to do, in order. Available at: https://github.com/sixteenmillimeter/mcopyFS.

```
    if (w[t]==3) {
      printPRO--;
    }
    if (w[t]==0) {
      rCount++;
    }
    if (w[t]==1) {
      rCount++;
    }
    if (w[t]==4) {
      place = t;
      t=loader.length;
    }
  }
}


void draw() {
  for (int t=0;t<lng;t++) {
    int intguy = w[t];
    if (w[t]!=0) {
      intguy = 4;
    }
    frame(c+(t*c), a/2, intguy, " ");

    intguy = w[t];
    if (w[t]!=1) {
      intguy = 4;
    }
    frame(c+(t*c), a+a/2+a/7, intguy, " ");

    intguy = w[t];
    if (w[t]!=2) {
      intguy = 4;
    }
    frame(c+(t*c), 2*a+a/2+(2*a)/7, intguy, " ");

    intguy = w[t];
    if (w[t]!=3) {
      intguy = 4;
    }
    frame(c+(t*c), 3*a+a/2+(3*a)/7, intguy, " ");
    //all
    frame(c+(t*c), 5*a+(4*a)/7, w[t], switcher(w[t]));
  }
  for(int g=0;g<w.length;g++){
   if(w[g]==4){
    place = g;
    g = w.length;
   }
  }
  if(place%24==0){
   lng+=24;
  }

  int[] r = new int[15000];
  String[] rS = new String[15000];
  for (int z=0;z<r.length;z++) {
    r[z] = 4;
    rS[z] = " ";
  }
  rCount=0;
  for (int v=0;v<lng;v++) {
    if (w[v]==0) {
      r[rCount]=0;
      rS[rCount]="x";
      rCount++;
    }
```

FIGURE 9.23 (2)

```
    if (w[v]==1) {
      r[rCount]=1;
      rS[rCount]=wS[v];
      rCount++;
    }
  }

  for (int t=0;t<lng;t++) {
    frame(c+(t*c), 6*a+a/2+a/7, r[t], rS[t]);
    frame(c+(t*c), 7*a+a/2+(2*a)/7, film[t], filmS[t]);
  }
  fill(220);
  textFont(font, 32);
  text("X",5,a/2+(10*mm));
  text("C",5,a/2+(26*mm)+a/7);
  text("F",5,a/2+(42*mm)+(2*a)/7);
  text("B",5,a/2+(58*mm)+(3*a)/7);
  String[ ] shorter = "X","C","F","B";
}



void mousePressed() {
  mstore = mouseX - mX;
  if (mouseY>220) {
    mstore2 = mouseX - mX2;
  }

  int X = mouseX - mX;
  int Y = mouseY;
  if (Y<(a/2)+71*mm) {
    if (Y>a/2) {
      int placerY = int((Y-(a/2))/(a+(a/7)));
      int placerX = int((X-c)/c);
      //UNCLICK
      if (w[placerX]==placerY) {
        if (w[placerX]==2) {
          printPRO--;
        }
        if (w[placerX]==3) {
          printPRO++;
        }
        if (w[placerX]==0) {
          wS[placerX]= " ";
        }
        if (w[placerX]==1) {
          wS[placerX]= " ";
        }
        w[placerX]=4;
        counter[placerY]--;
      }
      else if (w[placerX]!=placerY) {
        if (w[placerX]==0) {
          wS[placerX] = "x";
        }
        if (w[placerX]==1) {
          wS[placerX] = Integer.toString(printPRO);
        }
        counter[placerY]++;
        counter[w[placerX]]--;
        w[placerX]=placerY;
      }
      if (w[placerX]==2) {
        printPRO++;
      }
      if (w[placerX]==3) {
        printPRO--;
      }
```

FIGURE 9.23 (3)

```
      if (w[placerX]==0) {
        wS[placerX]="x";
        rCount++;
      }
      if (w[placerX]==1) {
        wS[placerX]=Integer.toString(printPRO);
        rCount++;
      }
    }
  }
}

void keyPressed() {
  if (key == 'c') {
    counter[1]++;
    w[place] = 1;
    wS[place]=Integer.toString(printPRO);
    rCount++;
    place++;
  }
  if (key == 'f') {
    counter[2]++;
    printPRO++;
    w[place]=2;
    place++;
  }
  if (key == 'b') {
    counter[3]++;
    printPRO--;
    w[place]=3;
    place++;
  }
  if (key == 'x') {
    counter[0]++;
    w[place] = 0;
    wS[place]="x";
    place++;
  }
  if (keyCode == 46) {
    wS[place-1] = " ";
    w[place-1] = 4;


  }
  if (keyCode == LEFT) {
    //   mcopy.write("b");
    printPRO--;
    delay(dlay);
  }
  if (keyCode == RIGHT) {
    // mcopy.write("f");
    printPRO++;
    delay(dlay);
  }
  if (keyCode == UP) {
    // mcopy.write("c");
    film[printCAM]=1;
    filmS[printCAM] = Integer.toString(printPRO);
    printCAM++;
    delay(dlay);
  }
  if (keyCode == DOWN) {
    // mcopy.write("x");
    film[printCAM]=0;
    filmS[printCAM] = "x";
    printCAM++;
    delay(dlay);
  }
```

FIGURE 9.23 (4)

```
260   if (key == 's') {
261     String[] saver = new String[w.length];
262     for (int y = 0;y<w.length;y++) {
263       saver[y]=Integer.toString(w[y]);
264     }
265     saveStrings("save.txt", saver);
266     delay(400);
267   }
268 }
269
270
271
272 void frame(float Xf, float Yf, int col, String txt){
273   noStroke();
274   fill(50);
275   rect(Xf, Yf, c, a);
276   stroke(0);
277   line(Xf, Yf, Xf+c, Yf);
278   line(Xf, Yf+a, Xf+c, Yf+a);
279   noFill();
280   //frame
281   if (col==0) {
282     fill(0);
283   }
284   if (col==1) {
285     fill(234, 255, 118, 100);
286   }
287   if (col==2) {
288     fill(255, 118, 239, 100);
289   }
290   if (col==3) {
291     fill(118, 255, 142, 100);
292   }
293   if (col==4) {
294   }
295   rect(Xf, Yf+d+f, c, b);
296   //perf
297   fill(220);
298   textFont(font, 12);
299   text(txt, Xf+c/6, Yf+a/1.3);
300   fill(40);
301   rect(Xf-d, Yf+d, e, f);
302   noStroke();
303   rect(0, 0, 30, (128*mm));
304   noFill();
305 }
306
307 String switcher(int in) {
308   String fine = " ";
309   if (in==0) {
310     fine = "x";
311   }
312   if (in==1) {
313     fine = "c";
314   }
315   if (in==2) {
316     fine = "f";
317   }
318   if (in==3) {
319     fine = "b";
320   }
321   if (in==4) {
322     fine = " ";
323   }
324   return fine;
325 }
326
327 //Copyleft sixteenmillimeter.com 2011
328 //M.C.O.P.Y. Film Controller version 0.8
```

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FIGURE 9.23 (5)

mcopy.js/arduinoNode.js at master · sixteenmillimeter/mcopy.j· GitHubs

sixteenmillimeter / **mcopy.js**

Star 0 Fork 0

branch: **master** **mcopy.js** / **arduinoNode.js**

Matt April 17, 2013 Ported functionality from arduinoFinder.php

0 contributors

221 lines (208 sloc) | 6.345 kb

Raw Blame History

```
1
2  var sys = require("sys"),
3          fs = require('fs'),
4          exec = require('child_process').exec,
5          io = require('socket.io').listen(8080);
6
7          io.configure(function () {
8                  'use strict';
9          io.set('transports', [
10                         'websocket'
11                         , 'flashsocket'
12                         , 'htmlfile'
13                         , 'xhr-polling'
14                         , 'jsonp-polling'
15         ]);
16 });
17
18 var noduino = {};
19 //---------------------------------------------------------------
20 // noduino Class
21 //---------------------------------------------------------------
22
23 noduino.serial = null;
24 noduino.arduinoC = null;
25 noduino.arduinoP = null;
26 noduino.cmd = ['f', 'x', 'c', 'b', 'p', 'd'];
27 noduino.allSockets = function (){};
28 noduino.init = function (arr) {
29         'use strict';
30         console.log('noduino.init <!--');
31         console.dir(arr);
32         console.log('noduino.init -->');
33         if (noduino.serial === null && noduino.arduinoC === null) {
34                 noduino.sp = require("serialport");
35                 noduino.serial = noduino.sp.SerialPort;
36                 var parseObj = {parser : noduino.sp.parsers.readline("\n")};
37                 if (arr.length === 1) {
38                         noduino.arduinoC = new noduino.serial('/dev/' + arr[0], parseObj);
39                         noduino.arduinoC.on('data', function (data){
40                                 var first = data.substring(0, 1);
41                                 if (first === 'f' || first === 'x' || first === 'c' || first === 'b' || first === 'p' ||
first === 'd') {
```

FIGURE 9.27 (1)

```
                                //if ($.inArray(first, noduino.cmd) > -1) {
                                        noduino.writeResponse('mono', first);
                                }
                        });
                        console.log('successfully connected to single arduino');
                } else if (arr.length === 2) {
                        noduino.arduinoC = new noduino.serial('/dev/' + arr[0], parseObj);
                        console.log('successfully connected to camera arduino');
                        noduino.arduinoP = new noduino.serial('/dev/' + arr[1], parseObj);
                        console.log('successfully connected to projector arduino');
                        noduino.arduinoP.on('data', function (data){
                                console.log('Raw return:' + data);
                                var first = data.substring(0, 1),
                                        sec = data.substring(0,2);
                                if (first === 'f' || first === 'x' || first === 'b' || first === 'p' || first === 'd') {
                                        noduino.writeResponse('proj', first);
                                } else if(sec === 'ca'){
                                        noduino.writeResponse('cam', data);
                                }
                        });
                } else if(arr.length === 0) {
                        //TODO: debug mode
                        //Thought: mono mode works well for debugging if the arduino is set to debug mode
                        //might need an additional case, though
                }
        } else {
                console.log('already connected');
        }
};
noduino._disconnect = function () {
        'use strict';
        noduino.serial = null;
        noduino.arduinoC = null;
        noduino.arduinoP = null;
};
noduino.time = function (){
        'use strict';
        //TODO: time responses
};

//-------------------------------------------------------------
// noduino sequence functions
//-------------------------------------------------------------
noduino.sequence = [];
noduino.which = 0;

noduino.write = function (arr) {
        'use strict';
        console.dir(arr);
        noduino.sequence = arr;
        noduino.writeAction();
};

noduino.writeAction = function (){
        'use strict';
        noduino.writeCases(noduino.sequence[noduino.which]);
        console.log('sent ' + noduino.sequence[noduino.which]);
        noduino.allSockets('uiSentCmd', {'sequence': noduino.sequence, 'which': noduino.which});
};

noduino.writeResponse = function (source, data){
        'use strict';
```

FIGURE 9.27 (2)

```
104         var blank = [];
105         if (noduino.sequence !== blank) {
106                 if (source === 'cam') {
107                         //console.log(data);
108                         var newData = data.split(':');
109                         data = newData[1].substring(0, newData[1].length - 1);
110                 }
111                 if (noduino.arduinoP === null){
112                         //Nothing special for now...
113                         if (data.length > 1) {data = 'c';}
114                         noduino.allSockets('uiRcdCmd', data);
115                 } else if (noduino.arduinoC !== null && noduino.arduinoP !== null ) {
116                         if (source === 'cam' && noduino.sequence[noduino.which] === 'x') {
117                                 console.log(source + ' returned ' + data);
118                                 return false;
119                         }
120                 }
121
122                 if (noduino.sequence.length === 1){
123                         console.log(source + ' returned ' + data);
124                         if (data.length > 1) {data = 'c';}
125                         noduino.allSockets('uiRcdCmd', data);
126                         noduino.sequenceCompleted();
127                 } else if (noduino.sequence.length !== 1 || noduino.sequence.length !== 0) {
128                         console.log(source + ' returned ' + data);
129                         if (data.length > 1) {data = 'c';}
130                         noduino.allSockets('uiRcdCmd', data);
131                         noduino.which += 1;
132                         if (noduino.which !== noduino.sequence.length) {
133                                 noduino.writeAction();
134                         } else {
135                                 noduino.sequenceCompleted();
136                         }
137                 }
138         } else if (source = 'mono') {
139                 //RIGHT NOW DEBUG IS THE ONLY CASE
140                 noduino.allSockets('uiRcdCmd', data);
141                 noduino.which += 1;
142                 if (noduino.which !== noduino.sequence.length) {
143                         noduino.writeAction();
144                 } else {
145                         noduino.sequenceCompleted();
146                 }
147         }
148 };
149
150 noduino.sequenceCompleted = function (){
151         'use strict';
152         console.log('sequence completed:');
153         console.log(noduino.sequence);
154         noduino.allSockets('sequenceComplete', noduino.sequence);
155         noduino.sequence = [];
156         noduino.which = 0;
157 };
158
159 noduino.writeCases = function (c) {
160         'use strict';
161         if (noduino.arduinoP === null) {
162                 noduino.arduinoC.write(c);
163         } else if (noduino.arduinoC !== null && noduino.arduinoP !== null ){
164                 if (c === 'c') {
165                         noduino.arduinoC.write('3');
```

FIGURE 9.27 (3)

```
166                 } else if (c === 'f' || c === 'b' || c === 'd') {
167                         noduino.arduinoP.write(c);
168                 } else if (c === 'x') {
169                         noduino.arduinoP.write(c);
170                         setTimeout(function () {
171                                 noduino.arduinoC.write('3');
172                         }, 300);
173                 }
174         }
175 };
176
177 //ported from arduinoFinder.php
178 noduino.find = function (callback) {
179         'use strict';
180                 //LIBRARY of known arduinos
181         var known = [
182                         '/dev/tty.usbmodem1a161',
183                         '/dev/tty.usbserial-A800f8dk',
184                         '/dev/tty.usbserial-A900cebm',
185                         '/dev/tty.usbmodem1a131',
186                         '/dev/tty.usbserial-a900f6de'
187                         ];
188         var puts = function(error, stdout, stderr) {
189                 if (error === null) {
190                         var arduino = [],
191                                 arr = stdout.split("\n");
192                         for (var i = 0; i < arr.length; i++) {
193                                 var check = arr[i].toLowerCase();
194                                 if (known.indexOf(check) !== -1 || check.indexOf('usbmodem') !== -1 ||
check.indexOf('usbserial') !== -1) {
195                                         arduino.push(arr[i]);
196                                 }
197                         }
198                         callback(arduino);
199                 } else {
200                         callback(error);
201                 }
202         };
203         exec('ls /dev/*', puts);
204 };
205
206 //socket server
207 io.sockets.on('connection', function (socket) {
208         'use strict';
209         socket.on('connectPrinter', function(data){
210                 noduino.init(data);
211                 socket.emit('connectPrinterResponse',{
212                         'success': true
213                 });
214         });
215         noduino.allSockets = function (key, data){
216                 io.sockets.emit(key, data);
217         };
218         socket.on('printerWrite', function(data){
219                 noduino.write(data);
220         });
221 });
```

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https://github.com/sixteenmillimeter/mcopy.js/blob/master/arduinoNode.js[9/1/14 11:16:32 AM]

FIGURE 9.27 (4)

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CHAPTER 10

Pinhole Photography

Film/video/digital

The etymology of the word camera comes from both the Latin word for chamber (a fancy word for a room) and the Greek word for a covered enclosure. A camera obscura (Latin for "dark room") was an optical device used for scientific investigation, entertainment and as an aid in drawing for over 2000 years. The basic mechanics of a camera obscura are a "dark chamber" with a very small opening (aperture) to a well-lit area beyond and it is possible to make one out of any room or box providing you can get it dark enough.

If you created an entirely dark chamber with just a small opening to the outside, what you would see opposite that opening would be an upside-down image of the outside world. The science behind this is rather ancient. Light travels in straight lines. This much was observed by a Chinese philosopher named Mo-Ti around 400 BCE. There were many other artists, philosophers and scientists whose fields of interest engaged with optics and light, and who used different kinds of optical devices in their research and work contributing significantly to the formulation of the camera obscura. The first accurate description of the science behind the device as well as how vision works can be seen in the writings of Abū ʿAlī al-Ḥasan ibn al-Haytham, born in Basra, Iraq, working out of Cairo, Egypt, in the 10th century CE and known in the Latin-speaking world as Alhazen. His work came to Europe via a 13th-century Latin translation and it is credited with revolutionizing medieval understandings of mathematics, optics and light.

Leonardo da Vinci (1452–1519) described the use of a camera obscura device as an aid in drawing in his *Codex Atlanticus* and artist Giovanni Battista della Porta (1538–1615) added a lens to the aperture (opening) on the box in order to focus the rays of light and make the image brighter. All that remained for the invention of photography was the discovery of a substance sensitive to light (e.g. silver), a suitable surface to put it on (e.g. metal or glass plates, paper), a way to control the duration of exposure (shutter) and to "fix" the image onto the plate or paper so that then it was possible for the image to last. Joseph Niépce, Louis Daguerre, William Fox Talbot and George Eastman are just a few of the names of artists and experimenters who worked on the development of silver-based photography.

In the 21st century, the photographic process can be exceedingly complicated, involving equipment that costs hundreds of thousands of dollars, or relatively simple. This chapter is about stripping down photography and cinematography to a very basic level. Taking away everything but light, light-tight device, light-sensitive surface inside that device and a fixed aperture or pinhole that we will use to create images. This chapter will discuss creating pinhole photos and movies both in silver process and digital. Like most things discussed in this book, even as the big film companies stop (or threaten to stop) producing silver process still and motion picture film, the interest in "old tech" like pinhole photography has increased dramatically since early 2000. There are many online resources devoted to it.

I started teaching pinhole cinematography to my students because of a rise in the production of lensless work within the film avant-garde. It was learning this technique that led me to an interest in all kinds of pinhole photography, videography and pinhole digital photo and cinematography. As with many of the topics in this book, students pushed the experimentation along the way, bringing in new ideas and ways of using the materials. We mostly experiment with pinhole cinematography, but this chapter begins with instructions on how to create a basic pinhole still camera and moves on from there. These instructions are for making a small camera to use 35mm still film with, but following these instructions there are a couple of pictures from my friend Dagie Brundert and her cameras made out of a coffee can and a cookie tin.

PINHOLE CAMERA

What you will need

- Black paper or gaffer's tape.
- A (clean) aluminum can or baking pan—something thin enough to make a hole in with a needle, but not so thin as to rip easily. I have also used black wrap, the matte black foil used in film production. It is easy to make a hole in but also tears easily and doesn't sand well.
- Matte black spray paint.
- Very fine sewing or beading needles.
- A new pencil with an eraser.
- Very fine (600 grit or greater) sand paper.
- Newspaper or a drop cloth to protect your work area.
- X-Acto knife or other precise cutting instrument.
- Scissors capable of cutting an aluminum can or pie pan.
- Some thin (very flexible) cardboard or card stock. Large index cards work, as do old file folders, or thin boxes from food like cereal or crackers.
- A box or can with a lid that can be made light tight. People have made pinhole cameras out of everything from Altoids™ tins to oatmeal boxes to

airplane hangers. The further the distance between the aperture (pinhole) and the light-sensitive surface (film or photo paper), the larger the image. However, the further the light has to travel, the longer your exposure time so bear that in mind. If you want to use 35mm still film, I recommend using something small, like a small box or can. If you are using photo paper, then a shoebox or similarly sized container will work great. You can also use a variety of film stock and place the film in whatever way you wish in relationship to the image coming into the light-tight container.

- 35mm film and the chemistry to develop it. I recommend using slow black and white film to start out with—especially if you have access to a black and white darkroom.
- A dark room or changing tent in which to load your camera.
- A dark room and chemistry to develop your film or paper.
- Access to a flatbed scanner is very helpful although not entirely necessary. IF NOT—a magnifying glass.
- A dense piece of cardboard (the back of a pad of paper works nicely), a book you don't care too much about poking holes in, a block of wood or a piece of linoleum—basically anything flat and harder than aluminum but soft enough that you can drill a little bit into it.
- A ruler or straight edge.
- A black Sharpie.
- A hole punch.
- Double stick tape or masking tape.

The process

MAKING THE PINHOLE

1. Take the pencil and stick the dull (threading) side of the needle into the eraser so that the pointy side is out. If the needle is longer than 1″ or so, it is a good idea to trim it down so that it doesn't bend when you use it to cut the hole in aluminum. You can use strong scissors or wire cutters to trim a thin needle down to size. A smaller hole will result in a crisper image.
2. Cut out a 1″ × 1″ square of your aluminum and tape it to your block of wood or dense cardboard or book or whatever.
3. Taking your ruler or straight edge, find the center of the square by drawing a line from diagonal corners so that you have an X in the center.
4. Using your pencil/needle drill, gently make a hole at the center of that X. This is accomplished by applying gentle pressure to the metal while spinning the pencil back and forth between your fingers. You do not need to push the needle clean through the metal; getting just the tip through is sufficient.
5. Once you have made the hole, sand it down with the fine sandpaper so

that it is flat and the edges are smooth. You can check the edges of the hole using your magnifying glass or by scanning the pinhole with a flatbed scanner. If you have Photoshop or a similar imaging program you can actually measure your pinhole, which could help you significantly in determining exposure times later. The hole should be round without jagged edges. If it isn't, keep sanding as jagged edges will cause the image to be soft/out of focus.

6. When the pinhole is prepared, gently insert the head of the drill back in the hole and gently paint both sides of it with matte black spray paint. Remove the needle before the paint dries or it might stick. Allow the paint to dry and then touch up the edges of the pinhole with your black Sharpie.
7. Using a flatbed scanner and Photoshop, measure your pinhole. WRITE THIS DOWN—YOU'LL NEED IT TO DETERMINE THE F-STOP OF YOUR CAMERA.

MAKING THE CAMERA

1. Take the box or can and spray paint the interior surface of both the container and the lid with matte black. Allow to dry.
2. If you are using a flat box take your ruler and make an X on the top by drawing a line from the diagonal corners. Using your ruler draw a small square, maybe ¼″ on all sides. Carefully, cut out just this area using your X-Acto blade.
3. Put the lid on the box and, using a small strip of cardboard or something else small enough to go through the opening you just made, carefully measure the distance from the inside edge of the opening to the back of the box (the focal plane) by marking with your Sharpie on the strip of cardboard or whatever you are using to measure with. Then, using a very precise ruler or your flatbed scanner and Photoshop, determine the precise length in millimeters of the focal distance of your camera. WRITE THIS DOWN—YOU'LL NEED IT TO DETERMINE THE F-STOP OF YOUR CAMERA.
4. Take the flexible cardboard, card stock, whatever and create a piece that is about the size of the top of the box or at least ½″ to 1″ larger on each side than the hole you just cut.
5. With your ruler draw an X on the cardboard from corner to corner and then use your hole punch to make a hole in the middle of that X. If you don't have a hole punch, turn the lid of your box over, center up the X and use the hole in the lid to draw a square on your cardboard and then cut that out with your blade.
6. Paint one side of this cardboard with your matte black paint.
7. When dry, tape the cardboard piece over the hole in the lid of the box ON THREE SIDES ONLY. Make sure the cardboard is totally flat against the box.

8. Measuring carefully, create a strip of cardboard that will slide into this pocket and leave about 1" or more above to grip.
9. Slip the piece of cardboard into the pocket, making sure that it is all the way to the bottom. Using your Sharpie and the square or punch hole, draw an outline on the "shutter" of where the opening on the pocket is.
10. Take the "shutter" out and, using your hole punch or blade, remove the cardboard in the marked area.
11. Paint one side of the "shutter" with matte black spray paint.
12. While it is drying, turn your lid over and affix the metal pinhole that you made to the interior of the box lid, making sure to place the pinhole in the center of the opening you have made.
13. Once your shutter is dry, slide it into the pocket and make sure that all the holes line up so that you can see the pinhole. When your "shutter" is in this position it is open. When the shutter is slid up ½" (covering the opening in the box) the shutter is closed and the film inside is not being exposed to light.

LOADING YOUR CAMERA

1. Because you won't be putting an entire roll of film into the camera at a time, go into a dark room or use your changing tent to cut a length that will fit easily into your "camera". Store these lengths in something that is light tight (like a 100ft 16mm film can) so that you can change them in the field if you have a changing bag.
2. Open your camera and, using double stick tape or a tape loop, adhere the BASE side to the inside of the box opposite the aperture.*
3. Before you go out into the light, make sure the shutter is closed.

*If you find that you enjoy this pinhole camera, you can perfect the interior to hold the negative without tape. The easiest way to do this is to mount a small strip of cardboard inside the box on both sides so that you can pop a correctly sized strip of negative behind them and it will stay put. Of course these "rails" would need to be painted with matte black paint as well.

TEST YOUR CAMERA

1. Take your loaded camera outside or get under a really bright light WITHOUT OPENING THE SHUTTER.
2. Develop that piece of film. If it is entirely clear then your camera is light tight, but if there is some fogging then your camera is not light tight. Try taping around the lip of the box so that the lid fits more tightly and make sure that your pocket and shutter apparatus is tight.
3. Once your camera has passed the light-leak test you are ready to take images!

DETERMINING THE F-STOP OF YOUR CAMERA

First, it should be said that shooting with a pinhole instead of a lens, and a paper shutter instead of an automatic one, leaves quite a bit to chance. In other words, if you want perfect exposures, you should probably use a regular old camera. If you're willing to embrace chance, but would like to get yourself somewhere in the neighborhood of a decent exposure, then determining the f-stop of your camera is a good place to start. The formula for doing so is quite simple: f-stop = focal distance/pinhole diameter. Thus if your focal distance is 500mm and your pinhole is .1mm your camera will have an f-stop of 500. Hold up, you say, my light meter doesn't go up that high. Well, yes. So there is a formula for figuring out your exposure time based on what your light meter does go up to. It is as follows:

1. Take a reading at the highest f-stop your light meter will allow. My Sekonic incident meter allows me to take a reading up to f128. On a bright sunny day, using a film with ISO 50, a proper exposure in full sunlight at f128 will take about 2 seconds.
2. Divide your focal length by the highest f-stop of your light meter; in this case 500/128 = 3.90625 and then square that number = 15.26.
3. Multiply the result with the number of seconds you got in your reading; in this case 2 × 15.26 = your exposure time. About 30½ seconds.

A couple of things should be obvious right away. Taking pictures with a pinhole requires a lot of light OR fast film OR both. But that's OK, because the longer the exposure time, the more forgiving it is if you, say, overexpose for a second or two. It is possible to get much faster film, so, in the above scenario, if ISO 400 film were used the exposure time would be about 3.8 seconds. In that case, one second over or under exposure would be very significant.

IMAGE DIAMETER/ANGLE OF VIEW

There is something that I haven't touched on, because frankly, if you throw too much into an experiment, it becomes discouraging. But what I am about to say should be fairly obvious. The focal distance (from the pinhole to the focal plane) determines the angle of view (how wide or telephoto the image will be) as well as the diameter of the image coverage area. A 50mm lens is called the "normal lens" in 35mm and renders about a 40° angle of view. Anything over 50° would be considered wide angle and anything under 20° would be telephoto.

The hole size also determines image sharpness and flare/distortion or lack thereof. A hole that is too big will yield an out-of-focus image. A hole that is too small could result in vignetting (a black circle around the image) and other image distortion. Lucky for us all, a guy by the name of Mr Pinhole has done

the math and created an online calculator to help pinhole camera makers determine the optimal pinhole size for the focal length of their camera. See www.mrpinhole.com/calcpinh.php.

It is possible to make telephoto lenses for pinhole photography and cinematography: you simply increase the distance between the focal plan and the pinhole. Of course, this also increases the f-stop and means that you need more light to get an image with full tonality. Wide-angle lenses are more difficult, because you would need to get closer to the focal plane.

MAKING PRINTS FROM YOUR PINHOLE NEGATIVES

Once you have made some good pinhole negatives it is very easy to scan them with a flatbed scanner in order to print them. Should you wish to print them in a darkroom, they should be long enough to fit in a normal enlarger. So, when you find a box you would like to use, make sure that you will be cutting your negative large enough to print. Remember, all of the formulas and calculations above are assuming that your measurements are correct and the film is sitting exactly against the back of the box in your camera and that you figure out a way to keep your camera still as you take an exposure. I taped a spring clamp to the bottom of my camera so that I could clamp it onto things. What is great about images from pinhole cameras is that they are unique. Entirely different from images obtained from any other device.

FIGURE 10.1
Dagie Brundert's Illy can camera. Courtesy of the artist.

FIGURE 10.2
Alvarado/Sunset—image taken with Illy can camera on 4 x 5 sheet film (Rollei or ADOX) 25ASA. Caffenol process. Courtesy of Dagie Brundert.

FIGURE 10.3
Dagie Brundert's cookie box camera.

FIGURE 10.4
Zauberwald—Magic Wood. Cookie box camera, round, almost 180° panorama. On ADOX CMS 20 roll film, 20 ASA. Caffenol process. Courtesy of Dagie Brundert.

There is a vibrant online community of photographers working with pinhole still cameras. For many of them these hand-made devices have become their preferred imaging method! There is also a gallery market for these retro photographs. As digital imaging becomes ever more perfect at rendering images, people still seem to appreciate the quality of something made simply, by hand. Dagie Brundert, a friend I met in one of these online forums dedicated to alternative/non-toxic processing chemistry (and interviewed in Chapter 7 of this book), has kindly shared some pictures of her hand-made still cameras.

PINHOLE CINEMATOGRAPHY

The first time I saw a film made with a pinhole camera was in the 1990s at the Ann Arbor Film Festival. I was transfixed. I cannot remember who made the film and unfortunately not even which year of the festival I was at, but the next time I heard of pinhole motion picture films it was in the work of Thomas Comerford. Working out of the University of Iowa, he had made a number of pinhole films and produced a zine outlining his process. It is with his permission that I reprint the zine at the end of this chapter. He visited Boston a number of times in the 2000s and held workshops with my students. It was from Tom that I developed the process of pinhole cinematography that is described as follows.

Like pinhole photography, pinhole cinematography is not ideal for rendering perfect images. In order to get a decent exposure it is necessary to either push the film one or more stops (increasing the grain) or film at a slower speed (changing any motion to fast motion in projection). Figure 10.5 is a still from Tom Comerford's *Figures in the Landscape* (2002). Shot in fast-speed color negative and pushed at least one stop, this still shows evidence of the increased grain. Besides Comerford, there are a number of other filmmakers who have experimented with pinhole for motion picture film. Paolo Gioli made films using a light-tight box with film strips laid in channels. Robert Schaller uses a pinhole camera, often with hand-made emulsion, to create his distinctive works. What is fun about it is that these films create very distinct looks.

FIGURE 10.5
Film still from Tom Comerford's *Figures in the Landscape* (2002). Courtesy of the artist.

What you will need

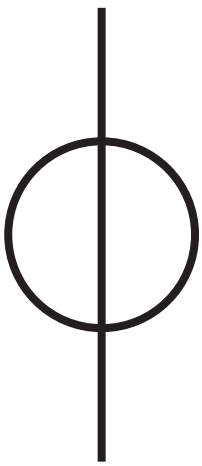


FIGURE 10.6
The mark on motion picture cameras that indicates where the film plane is. It is used for precise measurement of critical focus and, in the case of pinhole photography, precise measurement between the aperture (pinhole) and the film plane so as to establish the focal length of the lens.

- A variable-speed motion picture camera from which the lens can be removed.
- Hi-speed (500ASA) film. Cameras that only allow cine-speeds (12fps or higher) will require hi-speed film. Cameras that can be hand-cranked (e.g. the Bell & Howeel DR-70 or the Bolex with a back-wind key) can use lower ASA film. It is also possible to shoot pinhole film with an animation camera or time-lapse motor. Obviously this would create fast-motion images.
- A tin can or aluminum baking dish.
- Matte black spray paint.
- Black camera tape.
- A pencil with intact eraser.
- An assortment of sewing and beading needles.

The process

If you want to create the optimal-diameter pinhole, it is a good idea to begin the process by measuring from the film plane of the camera you will use to the edge of the lens mount. On many 16mm cameras there will be a mark (see Figure 10.6) indicating where the film plane is. On the Bolex it is directly behind the lever for the variable shutter. By taking a lens off and turning the turret, I was able to measure from the lip of the turret, where I will attach my pinhole, to the film plane. I used strips of index card and a Sharpie to make my measurement. I measured three times and then scanned the strips

FIGURE 10.7
A scan of the measuring strips used to establish the focal length of my pinhole lens.

(Figure 10.7) and used Photoshop to calculate their precise length. Using an average of the three I was able to determine that my focal distance for a pinhole set directly on the turret was 22mm. So the first step in making a pinhole lens or set of lens (easy to do if you have extension tubes with a Bolex) is to establish your focal distance.

Then using the Mr Pinhole camera design calculator (Figure 10.8) you can calculate the optimal pinhole diameter for your focal length. As you can see in Figure 10.8 my sunny-day exposure for Tri-X film (200ASA/ISO) would be 1/8 of a second. If you intend to use cine speeds (at 12FPS, the adjusted shutter speed of a Bolex is 1/40 of a second) you will need to get that pinhole significantly larger, use a faster film, get more light or hand-crank, or use an animation Bolex at about 1.25 frames a second. All of these things involve a compromise of some sort. The fastest motion picture stock on the market right now is 500ASA color negative and it is significantly more tolerant of push-processing than black and white film. Pushing the film means rating the film up to two stops over its optimum exposure range. If you push 500ASA film two stops you could rate it at 2000ASA. This would greatly increase the graininess of the stock, but would easily get you in the range of 24FPS for a Bolex on a sunny day.

A 22mm lens is pretty close to the "normal" (25mm) lens in 16mm. In order to get a wider angle with a Bolex, it is necessary to put your pinhole beneath the turret. I have tried to put the pinhole in the filter holder of the Bolex, but the thickness of the tin prevented the filter holder from seating properly. The best way I found to get a wide-angle pinhole lens was to put an optically clear

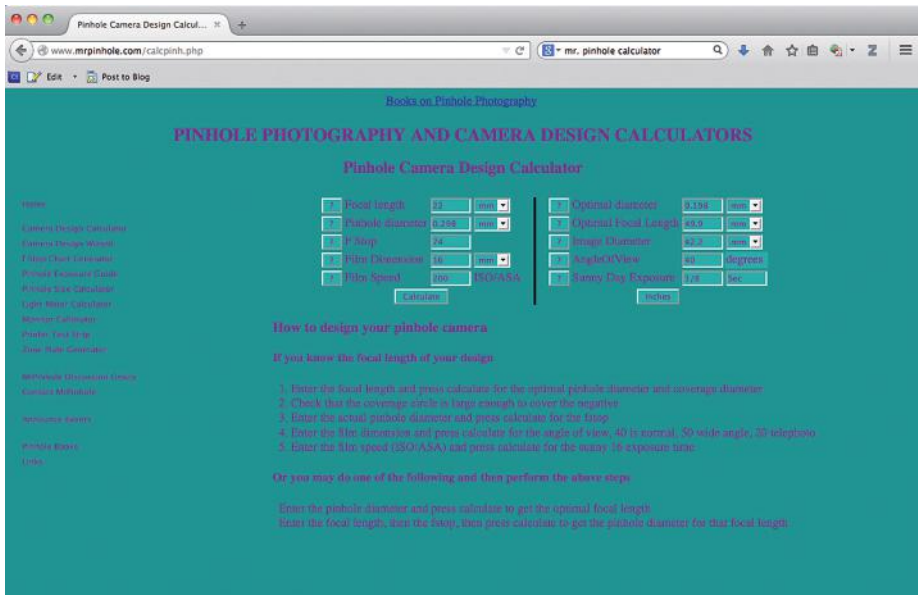

Pinhole Camera Design Calcul...
www.mrpinhole.com/calcpinh.php
mr. pinhole calculator
Edit
Post to Blog
Books on Pinhole Photography
PINHOLE PHOTOGRAPHY AND CAMERA DESIGN CALCULATORS
Pinhole Camera Design Calculator
Focal length
Pinhole diameter
F Stop
Film Dimension
Film Speed
ISO/ASA
Calculate
Optimal diameter
Optimal Focal Length
Image Diameter
AngleOfView
Sunny Day Exposure
inches
How to design your pinhole camera
If you know the focal length of your design
1. Enter the focal length and press calculate for the optimal pinhole diameter and coverage diameter
2. Check that the coverage circle is large enough to cover the negative
3. Enter the actual pinhole diameter and press calculate for the fstop
4. Enter the film dimension and press calculate for the angle of view, 40 is normal, 50 wide angle, 20 telephoto
5. Enter the film speed (ISO/ASA) and press calculate for the sunny 16 exposure time
Or you may do one of the following and then perform the above steps
Enter the pinhole diameter and press calculate to get the optimal focal length
Enter the focal length, then the fstop, then press calculate to get the pinhole diameter for that focal length

FIGURE 10.8
The pinhole calculator on www.mrpinhole.com.

filter in the filter holder (to protect the ground glass) and then carefully place the pinhole over the gate area making sure to mask off any light leaks. This placement will get the camera to an f94 (with a smaller adjusted optimal pinhole diameter of .17mm) and put your shooting range around 24FPS on a sunny day if you rate 500ASA film at 2000ASA.

It is also fairly easy to get a telephoto lens for the Bolex; if you have extension tubes you can mount a pinhole lens on the end of one of them. Extension tubes usually come in a set of 5mm, 10mm, 20mm and 40mm. Adding the depth of the 20mm tube to our 22mm focal length would create a pinhole lens with an optimal pinhole diameter of .28mm, which would create a 21° (telephoto) angle of view. Interestingly, because the optimal pinhole is so much larger, the sunny-day exposure for 500ASA film rated at 2000ASA is still around 1/30 of a second or 8–12FPS. Obviously this could fall a bit below the normal cine speed of a Bolex although the Bell & Howell 16mm DR-70 can run at 8FPS cine speed. Both the Bolex (Rex 3 and higher) and the Bell & Howell can also be hand-cranked. Obviously hand-cranking would necessitate establishing a rhythm for cranking a particular number of frames a second and would require a bit of practice.

It is also possible to create pinhole lenses for Super-8 cameras that have removable lenses such as a Bolex or Bealieu and for 35mm motion picture cameras such as the Bell & Howell Eyemo. The steps are much the same as producing a pinhole lens for the still cameras. In fact, making a pinhole lens for cinematography is even easier because you don't have to make the camera itself. What follows are the basic steps.

MAKING A PINHOLE LENS FOR CINEMATOGRAPHY

1. Determine the focal distance between the film plane and the pinhole. This is easiest if your camera has a focal plane mark (as most motion picture cameras do for focus—see Figure 10.6), but if not you need to get the shutter out of the way so that you can measure it manually. BE CAREFUL—shutters are delicate and easily bent/broken. It would be better to guess a bit than to ruin your camera.
2. Once you have determined your focal distance, you can use the calculator at www.mrpinhole.com/calcpinh.php to determine your optimal diameter. This will help you select the needle you want to use to drill your hole. You should try to avoid using a needle that is larger than the hole you want to drill. If it is, you will only want to drill the tip of the needle through.
3. You will want to cut your aluminum sheeting slightly larger than the opening you wish to cover. Really look at the camera and see how the pinhole will fit on. Make sure to cut it large enough to fit, but not so large that it won't sit properly.
4. Find the center of the piece of tin by making an X from diagonal corner to corner (as you did with the box above).
5. Drill your hole at the intersection of these lines and then sand it gently on both sides with ultra-fine sandpaper until smooth.
6. If you have access to a flatbed scanner, scan the pinhole and measure it in Photoshop (see Figure 10.9). Another way to measure it is to look at it next to a ruler with millimeter measurements under a loupe. You can estimate what percentage of a millimeter the hole is. Obviously this is less precise, but I've seen it get filmmakers in the ballpark of a decent exposure.
7. Once the pinhole is smooth and round, gently insert a needle into the pinhole and, using matte black spray paint, paint both sides of the tin. Remove the needle before the paint dries so it does not get stuck in the aperture.
8. Touch up the camera side of the pinhole lens and the interior of the hole itself with a black Sharpie so that there is no shiny metal to cause refraction. At this point you may want to scan the pinhole again and re-measure it just to confirm.
9. Using black camera tape, secure the pinhole to the camera.
10. Using the confirmed f-stop (recalculate if the pinhole has changed size slightly) go somewhere really bright and shoot some film!
11. Develop as needed—either send the film to a lab or develop it yourself. Remember to compensate if push-processing is required.

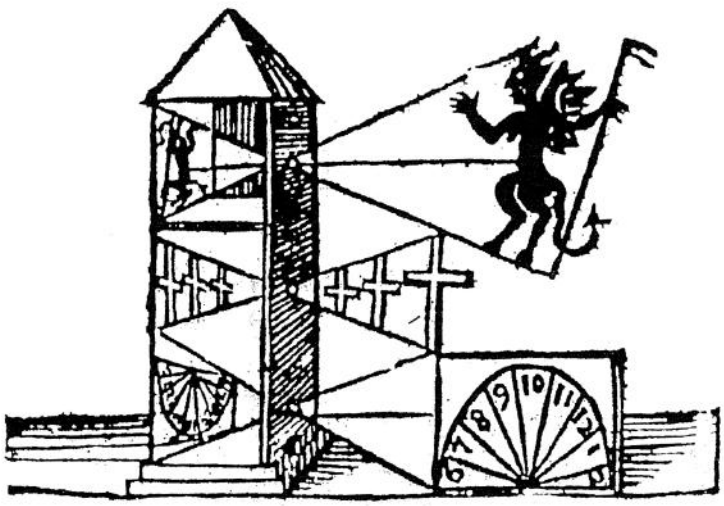
FIGURE 10.9
Scan in Photoshop of the pinhole lens used to measure aperture.

Between 1999 and 2002 Tom Comerford produced four films using the pinhole technique with 16mm film (thomascomerford.net/film_photo.html). He toured extensively with these works and produced a zine called *Pinhole Notes* to distribute alongside his work. It is with his permission that I am reproducing that zine on the following pages.

DIGITAL/VIDEO PINHOLE

Any camera that has a removable lens (and will still function when the lens is removed) can be turned into a pinhole camera including one that is digital or even analog video. With video or digital cameras, you can see your images through the viewfinder or on the screen, and some artists have used this to their advantage to manipulate the pinholes themselves as they shoot. In addition, you don't need to worry about figuring out the f-stop of your pinhole lens, although you will want to experiment (and it is very easy to do so) with different-size pinholes. One of my students, Nicholas Tamburo, even experimented with using more than one pinhole on his digital camera and the resulting overlapping images (Figure 10.30) are quite stunning. You can watch his entire video on the website. It is possible to create multiple pinholes on a film or still camera as well, but more difficult to gauge the results.

Pinhole Notes



by Thomas Comerford

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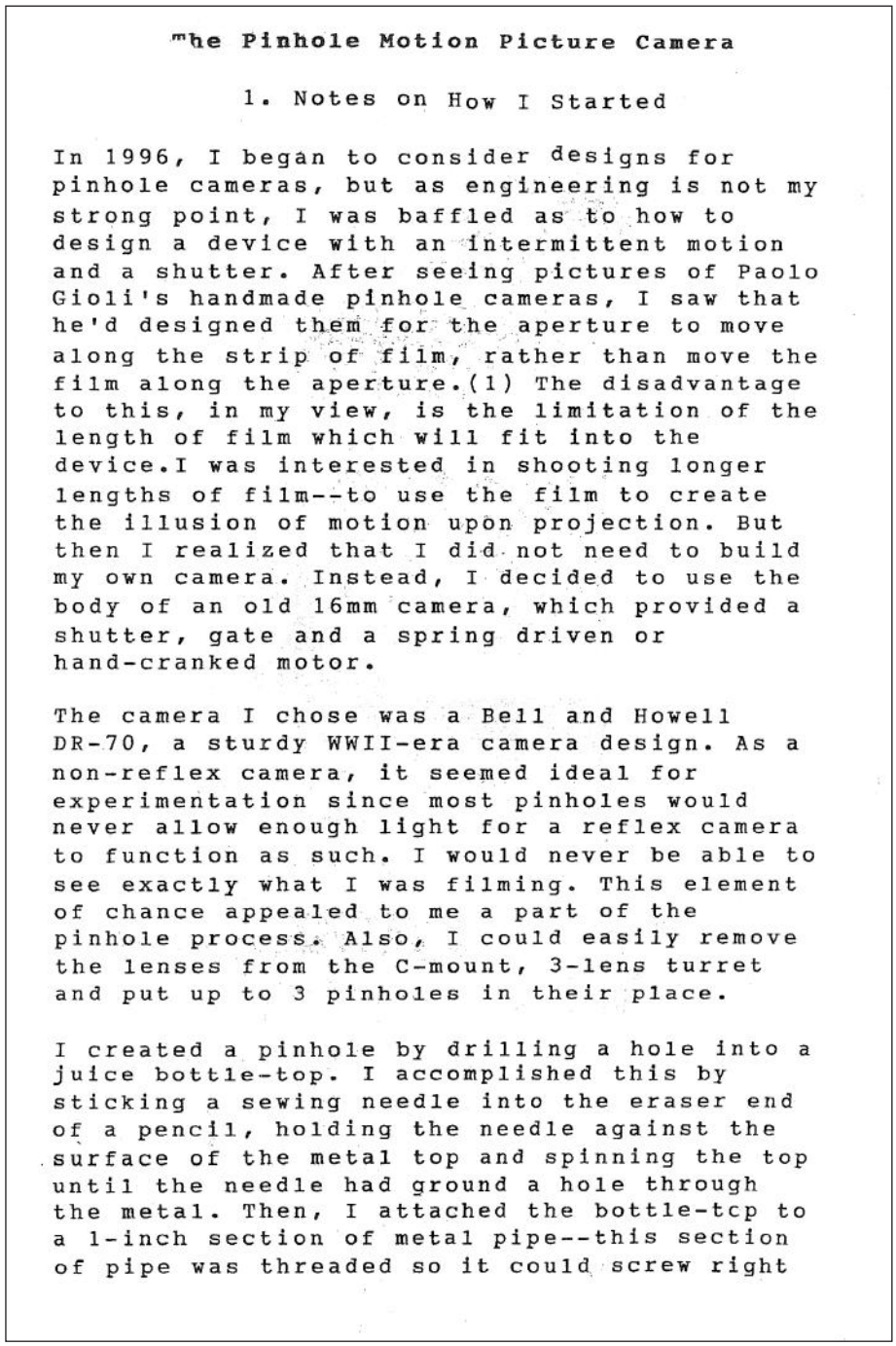
FIGURE 10.10



"he Pinhole Motion Picture Camera

1. Notes on How I Started

In 1996, I began to consider designs for pinhole cameras, but as engineering is not my strong point, I was baffled as to how to design a device with an intermittent motion and a shutter. After seeing pictures of Paolo Gioli's handmade pinhole cameras, I saw that he'd designed them for the aperture to move along the strip of film, rather than move the film along the aperture.(1) The disadvantage to this, in my view, is the limitation of the length of film which will fit into the device.I was interested in shooting longer lengths of film--to use the film to create the illusion of motion upon projection. But then I realized that I did not need to build my own camera. Instead, I decided to use the body of an old 16mm camera, which provided a shutter, gate and a spring driven or hand-cranked motor.

The camera I chose was a Bell and Howell DR-70, a sturdy WWII-era camera design. As a non-reflex camera, it seemed ideal for experimentation since most pinholes would never allow enough light for a reflex camera to function as such. I would never be able to see exactly what I was filming. This element of chance appealed to me a part of the pinhole process. Also, I could easily remove the lenses from the C-mount, 3-lens turret and put up to 3 pinholes in their place.

I created a pinhole by drilling a hole into a juice bottle-top. I accomplished this by sticking a sewing needle into the eraser end of a pencil, holding the needle against the surface of the metal top and spinning the top until the needle had ground a hole through the metal. Then, I attached the bottle-top to a 1-inch section of metal pipe--this section of pipe was threaded so it could screw right

FIGURE 10.11

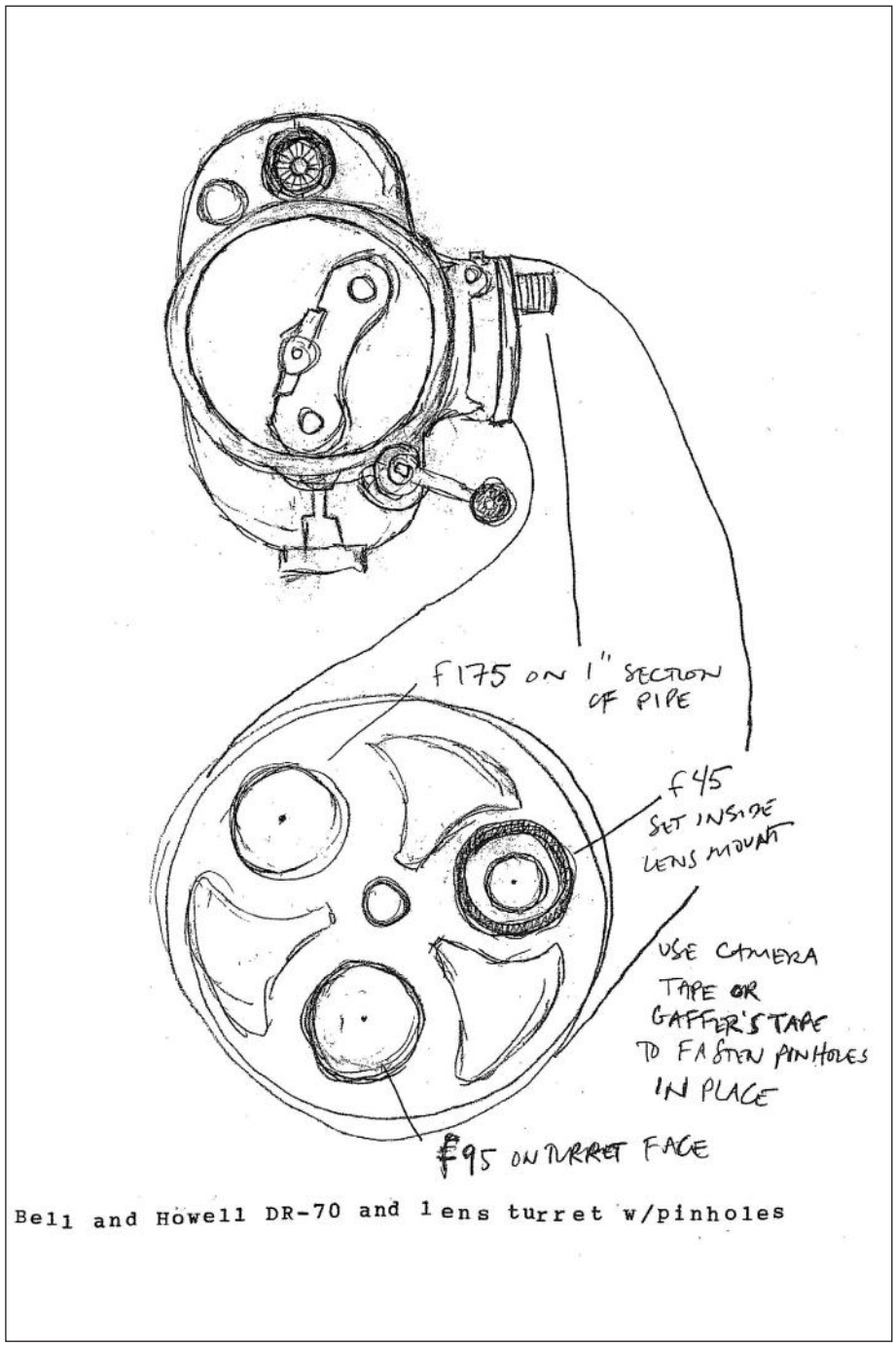

f175 on 1" section of pipe
f45 set inside lens mount
use camera tape or gaffer's tape to fasten pinholes in place
f95 on turret face
Bell and Howell DR-70 and lens turret w/pinholes

FIGURE 10.12

into t[illegible] c-mount of the lens turret. Using a rough measurement and calculation, I determined my f-stop. I measured the pinhole using a fine-ruled ruler and a lupe (or a magnifying glass) on a light table. I also measured the focal length (distance from pinhole to film plane). Once I had these values, I plugged them into this equation:

f-stop = focal length/pinhole diameter

I calculated my aperture roughly to be f-64. Since the slowest frame rate available on the DR-70 was 8 fps, I was limited to making exposures in extremely bright (sunlit) conditions even with the filmstock I was going to use--Kodak 7278 (Tri-X), a high-speed reversal black and white film (200 ASA).

I shot most of the roll outdoors between 8-12 fps during mid-morning sunlight under clear skies in Solon, IA. Later, I shot some indoor, tungsten-lit still life footage, attempting to advance the shutter by hand, holding it open for the necessary seconds indicated by my light meter. While all of this footage more or less turned out, the outdoor shots looked the best. Yet, because my pinhole was so large, the images were extremely out of focus. The ideal aperture to achieve crisp focus at the focal length I was using (1") was much smaller.(2) I was disappointed with the results, not because of the soft focus, but because the images as moving pictures were so briefly on screen since the projector advanced them two to three times as fast as I had shot them. And it was (and still is) a conscious decision on my part to avoid optically printing the images to slow them down because of the importance of film as recorded moment to me. Optically printing these pictures, in my mind, would completely change their meaning. So I ultimately wanted to find a way to shoot pinhole at faster frame rates.

FIGURE 10.13

In the summer of 1997, I had the opportunity to do more tests with pinhole motion pictures. I drilled a number of pinholes (in the same manner described earlier), this time into the bottom of an aluminum pie pan. I used fine sandpaper to remove the burr formed by the action of drilling. I roughly measured these holes and found two that I wanted to work with. The smaller pinhole (@0.19843mm) I mounted right on the face of the lens turret, creating more of a wide-angle pinhole. With such a short focal length, my aperture calculated to be around f-95. I mounted the larger hole onto the 1-inch section of pipe, creating more of a telephoto situation, with the aperture around f-175. To prevent excess light reflection in the camera, I painted the backs of the pinholes and the inside of the pipe length black. For exposure tests, I again used 7278. In natural light indoors (direct sunlight entering through the window), I shot footage of a time machine that I'd made for use in another film. I exposed the majority of the film at 8-12 fps using both pinholes. But near the end of the roll, I discovered I could hand-crank the motor using the camera's rewind crank by engaging in run-lock mode--ie, pushing down the trigger and locking it in place--while the motor spring had no wind on it. Most of the motorized footage turned out too dark to use, but this hand-cranked footage, which I'd cranked somewhere between 4-8 fps turned out well-exposed. The jittery, flickery (exposure varied by frame) really struck me. From that point on, I began to hand-crank all film through the pinhole camera for a few years.

2. Technical Notes: the Cinema Obscura series

In October 1997, I began shooting footage for what eventually became my first finished pinhole film, Fey Eyes Pin Holes Drums Hum. My method was to record specific spaces that

FIGURE 10.14

I was ıiliar with: my home in Iowa City, a railroad switchyard near my home and a field near my childhood home in Ohio. I began shooting by switching from reversal stock to negative stock. Most negative stock is available at faster speeds than reversal, so I saw this as an exposure advantage--for example Kodak 7222 (250 ASA), a high speed b&w film, is about 1/4 stop faster than the film I'd been using, 7278. Later, I would learn that negative stock is also more tolerant of push-processing, especially color negative.
Reversal film tends to look very muddy when it's push-processed.

The footage used in Fey Eyes was shot between November 1997 and September 1998 in Iowa and Ohio. I shot almost exclusively on bright, sunny days or days with a few clouds in the sky. If at any point the sun dipped behind clouds, I would wait until it reappeared before exposing film. Direct sunlight in images allows for higher contrast. Since pinhole tends to be a very low-contrast image, the more direct/specular light falls onto a scene, the more definition surfaces and textures will have in the images. I used two kinds of color negative film for shooting: Kodak 7297 (250 ASA), a high-speed, daylight balanced stock, now discontinued; and Kodak 7279 (500 ASA) a high-speed, tungsten-balanced stock, part of Kodak's Vision series. With both the f-95 and f-175 pinholes, I exposed all film by hand-cranking 4-8 fps. As expected, the tungsten-balanced stock was overly-sensitive to the blue end of the spectrum, so those images had a bluish cast to them. I completed Fey Eyes in April 1999.

In the summer of 1999, I began a film about a railroad switchyard near my house in Iowa City. To shoot this film, I attempted pushing color negative film with pinhole exposures. I

FIGURE 10.15

did this by rating the film at a higher ASA than recommended and asking the lab to compensate by processing the film longer. The film I used for this project was Kodak 7289 (800 ASA), a then brand new color negative stock balanced for tungsten light. When making exposures, I rated the film at 3200 ASA, and I hand-cranked the film between 18-24 fps using the f-95 pinhole. It was bright and sunny that Iowa afternoon, but some clouds did blow over, briefly, during a shot, so I slowed my cranking down to adjust.The trade-off I made in accessing faster film speed via push-processing 2 stops was an increase in graininess of the image (especially when compared to Fey Eyes). But I like grain, so I completed Départ in collaboration with François Geneau in April 2000.

I had an idea for a film that spring which would require me to shoot interiors and windows, something I briefly had attempted in Fey Eyes. The film's conception and imagery also led me to choose black and white filmstock--which would be more limited in exposure range than the color stock I'd been working with. To make ILLA CAMERA OBSCVRA, I tried a few different stocks. For some of the film, I shot Ilford HP-5 400 (400 ASA), b&w negative at 8 fps using the spring-wound motor and the f-95 pinhole. I rated the film at 800 ASA and had it push-processed one stop. For the rest of the film, I shot Kodak 7222, b&w negative (250 ASA), rating it at 1000 ASA and having it push-processed two stops (same frame-rate and pinhole). I could have hand-cranked the film to allow myself a better chance for exposure, but it was important to me to keep the camera as still as possible for this film. Based on my pinhole and minimum frame rate (8 fps), the only kind of light which would allow for the possibility of an image was direct sunlight, either coming in through the windows or

FIGURE 10.16

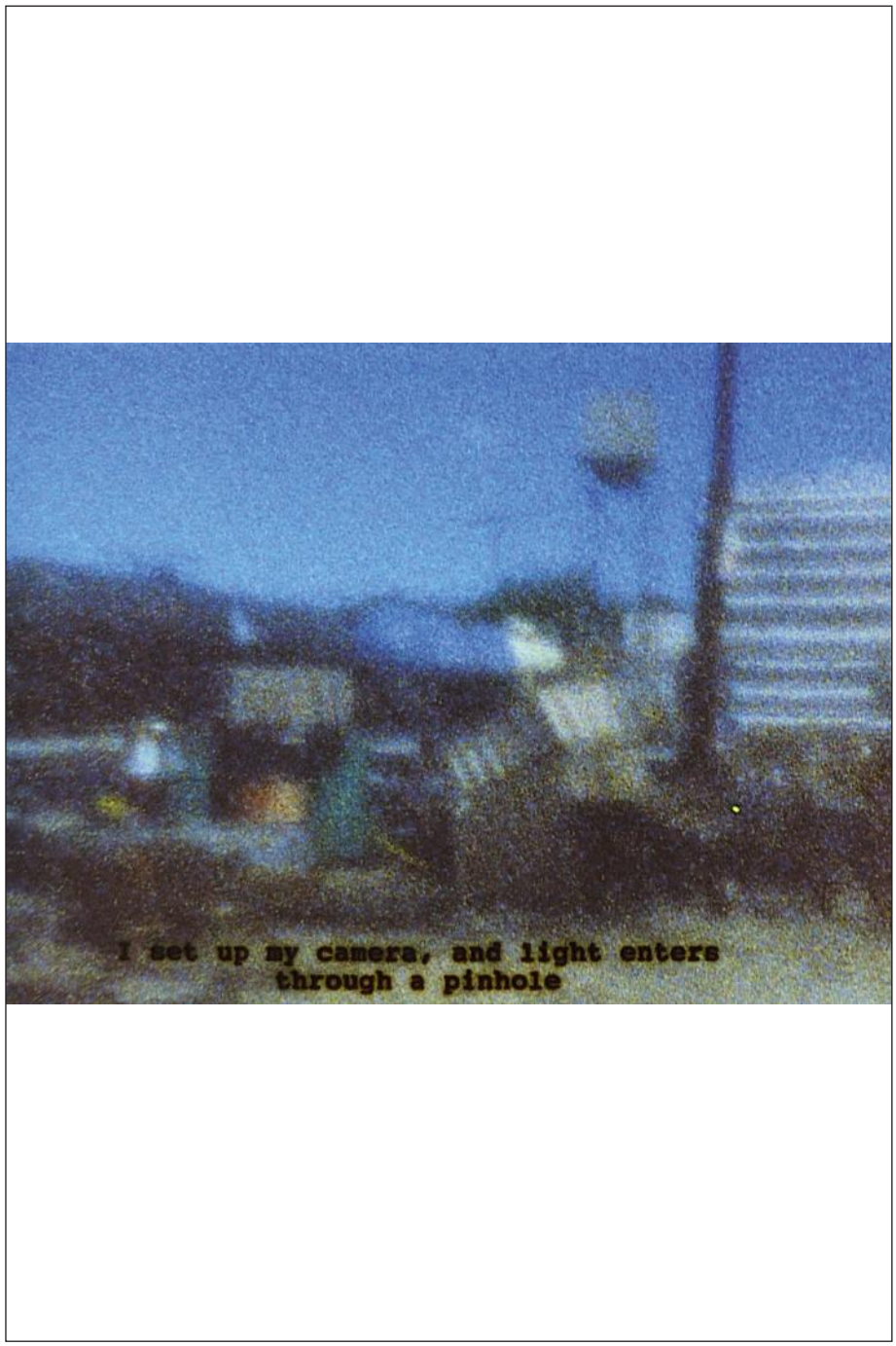


FIGURE 10.17

hitting jects outside the windows. Both stocks responded well to the push-processing, offering grainy, muted, low-contrast images. There was a marked different in the contrast of the Kodak and Ilford stocks which is visible in the film--the Ilford stock accounting for the fainter, greyer images.

My recently completed film, Figures in the Landscape, dealt with ideas which first apeared in Fey Eyes, about human interaction with the landscape and land use. I wanted to try to achieve more saturated colors to pinhole images than I'd been able to get in Fey Eyes or Départ. So I elected to test out Fuji F-500 color negative stock (ASA 500), tungsten balanced. I rated it at 2000 ASA and had it push-processed two stops. I created all the exposures in bright sunlight in Schaumburg, IL--usually in early to mid-morning. With the f-95 aperture, I ran the film at 24 fps; with the f-175 aperture, I ran the film at 8 fps. Also, for this film, I created a new pinhole aperture which I mounted even closer to the film plane by securing inside the c-mount opening. This aperture was around f-60, which I exposed at 48 fps. Sadly, I lost this pinhole when I dropped it in a meadow. I was able to shoot some film with it before I lost it though. My instincts about the Fuji film proved correct--I was able to achieve more saturated color than with the Kodak color negative, so I proceeded to shoot the entire film with this same stock. I've since learned that Fuji's color composition is better geared towards reproducing blues and greens than Kodak stock.

Notes

(1) See Paolo Gioli's exhibition catalogues for these images. Try interlibrary loan if you can't find them at your library.

(2) See Eric Renner's Pinhole Photography for this aperture information.

FIGURE 10.18

3. Additional Notes: the Rex Bolex

I've been teaching a course at the School of the Art Institute of Chicago over the last 3 years called Imagemaking. We spend about a month making pinhole films. Since the school is equipped with Rex Bolexes (that is, Bolex cameras with reflex viewfinding systems), we often adapt these cameras for pinhole use. In some ways, the camera is similar to the Bell and Howell DR-70 that I use, but there are enough significant differences that I will discuss them here.

The primary difference between a Bolex camera and most other motion picture cameras is the size of the shutter. While most cameras have a standard 180 degree shutter, the Bolex's is smaller: 135. Therefore the Bolex's effective shutter speed is different from a camera with a 180 shutter. And obviously, shutter speed is highly important to factor in when determining an exposure. To calculate your shutter speed at any frame rate with any camera, use the following formula:

shutter speed = 1/fps * shutter angle/360

The Bolex Rex cameras are additionally complicated, because there is a prism (called a beam-splitter) behind the taking lens which siphons off some of the light entering the camera in order to form an image in the viewfinder. The standard rule is that the effective shutter speed of a Bolex at 24 fps equals 1/80 second (the shutter speed of a non-rex Bolex at the same speed is 1/65; the shutter speed of a camera with a standard shutter at the same speed is 1/50). This difference is equivalent to about 1/3 of an f-stop. Exposure must be adjusted accordingly.

So, for example if your light meter tells you that with a fixed pinhole aperture of f-80,

FIGURE 10.19

your ex sure should be at 1/16 second shutter speed (8 fps on a camera with a standard shutter), for the Rex Bolex, you would need to allow the shutter open longer to let in 1/3 more light to compensate for light lost from the prism. Roughly, you would expose at 1/12 second with the bolex (6 fps). In this case, because the minimum frame rate of the Bolex is 12 fps, you would need to hand-crank the camera.

The Bolex allows for both hand-cranking and single frame exposures. Hand cranking is possible through the use of the rewind key. Normally the rewind key is used to wind the film back in the chamber for the creation of double exposures. To use the key for hand-cranking, disengage the motor; put the trigger switch into run-lock position; insert key into opening; and crank away with a clockwise motion at however fast or slow you require for an exposure. Single frame is possible with 2 different options: intermittent, where the shutter makes a full revolution (1/40 second shutter speed); or timed, where the shutter stays open as long as you hold in the trigger. To select between timed and intermittent, set the knob marked "T" and "I" to the respective position. The timed single-frame exposure is a distinct advantage not offered by many cameras--it allows you to make exposures in overcast or darker situations. Be sure to consult a film data sheet (downloadable from the Kodak website), to determine the reciprocity failure of your filmstock if you plan on creating exposures longer than 1 second. You may have to make further exposure adjustments.

4. Additional Notes: Strip Cameras

In the last few years, I also have conducted tests with cameras made out of cardboard and gaffer's tape. The camera I made was about 3

FIGURE 10.20

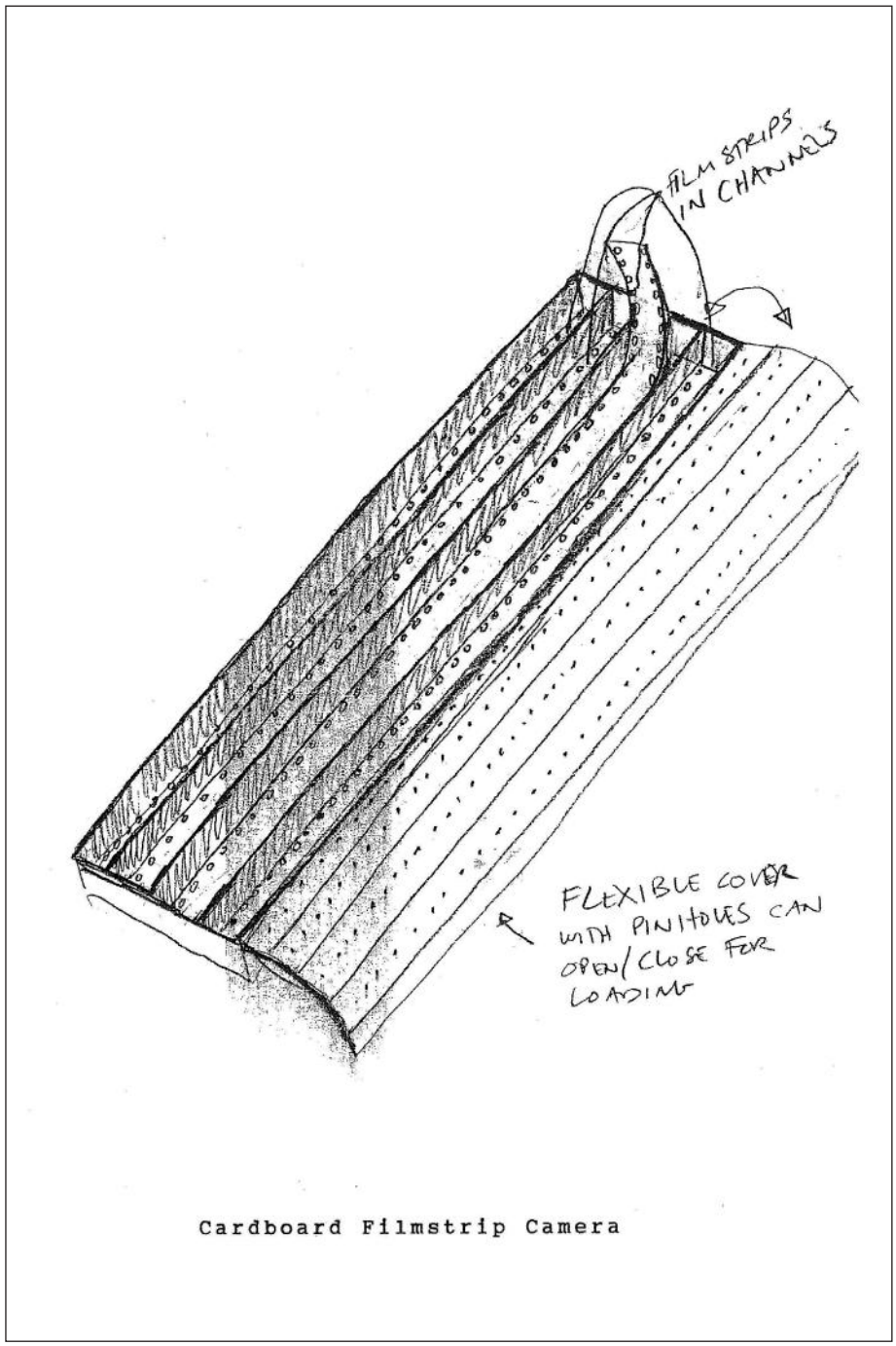

FILM STRIPS IN CHANNELS
FLEXIBLE COVER WITH PINHOLES CAN OPEN/CLOSE FOR LOADING
Cardboard Filmstrip Camera

FIGURE 10.21

feet lo and held 4 strips of film (each about 72 frames long) vertically in 4 channels separated by strips of cardboard. Pinholes were made on the front of the camera by poking holes into 16mm black leader with thumbtacks, with one hole per frame corresponding to the frame of the filmstock in the camera. Since the loading process for this camera is time-consuming, I have not had a chance to test it extensively. In the Spring of 2000, I did several tests, exposing 8 sets of strips in the camera. The filmstock was 7302, a b&w printstock without an assigned ASA (for practical purposes, it's somewhere between 6-20). I exposed each set of strips for 5 seconds, holding the camera in front of windows looking out on a bright, sunny day. I then processed the strips myself as negatives. The results are difficult to see projected due to the short lengths, but when viewed on a light table, the strips reveal overlapping images of the windows and blinds and buildings and distortions where the strips did not lie completely flat.

5. Additional Notes: Super-8

In the course I taught, some students have created pinhole cameras simply by adapting Super-8 cartridges. The following method is provided by filmmaker Brian Frye as a way to proceed:

Remove the cartridge from the packaging. Use electrical tape to fix a washer over the opening in the cartridge. Then take a little piece of tinfoil (or something similar) and poke a pinhole in it. Center the hole over the hole in the washer, and tape it down. To advance the film, melt the end of a Bic pen cap, and shove it into the take-up spindle of the cartridge. By turning clockwise (you want the film to move downward), you move the film through the camera. Be sure to employ your finger as a shutter, covering the opening

FIGURE 10.22

while the film advances, uncovering the opening to make an exposure. Try to advance the film in small increments. Kodachrome works really well--use a small pinhole and a nice long exposure time. Not a whole lot of control is possible, but with practice who knows.

6. Resources: Print and Web

Pinhole Photography by Eric Renner

Pinhole Resource: www.pinholeresource.com

Pinhole Visions: www.pinholevisions.org

Kodak: www.kodak.com/US/en/motion

Flicker Home Page: www.hi-beam.net

FIGURE 10.23

FIGURE 10.24
A still from DSLR pinhole video by Nicholas Tamburo.

The simplest way to create a pinhole lens for a digital or video camera is to take black wrap (matte black aluminum foil used in film/video production), poke a hole in it and tape it over the lens mount. Remember that the image sensor in the camera is EXTREMELY delicate. If you get dust on it, or scratch it, cleaning or replacing it can be costly. So if you want to protect your camera a better route and one that allows more reproducible results is to obtain a second body cap for your camera, drill a hole in it and then create a "matte box" for your various manufactured pinholes. This way you can slide in different pinhole lenses easily and you can also manipulate the pinhole lens as you shoot, which creates a very interesting sliding effect. In Chris Keeney's book *Pinhole Cameras: A Do-It-Yourself Guide* he advises putting your pinhole on the inside of the body cap. In my experiments with my students, I found that putting the pinhole on the outside of the body cap allowed for greater experimentation with size and configuration. However, he had some very useful suggestions and so what follows has been influenced by his research.

What you will need

- A video or digital camera that you can take the lens off of but which will still function. One of the fantastic things about the forward march of progress with video and digital technology (and the built-in obsolescence) is that the world is quite literally littered with video and digital cameras that used to be top of the line but are now considered junk. I recommend you begin experimenting with one of these. If you like what you do and want to continue using that piece of equipment, great! If you want to move on to a piece of equipment with better resolution or more functions, at least you will have some experience with a piece of equipment that is more "disposable".

- An aluminum can or pie tin.
- Matte black spray paint.
- Black camera tape.
- A Sharpie.
- A ruler.
- A body cap for the camera you are using (optional).
- A back lens cap for the camera you are using (optional).
- An optically clear gelatin filter (optional).
- A manila folder or thin black show card or thin cardboard (for your matte box mount).
- A drill and drill bit (only if you're making a hole in your body cap).

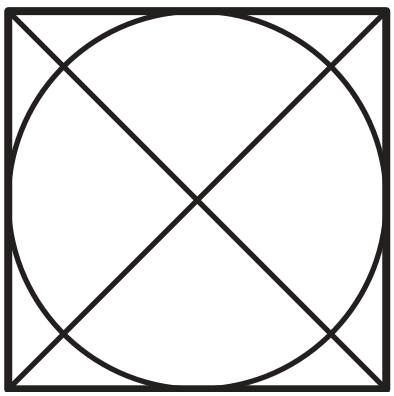


FIGURE 10.25
Trace your lens cap and then find the center by making an X.

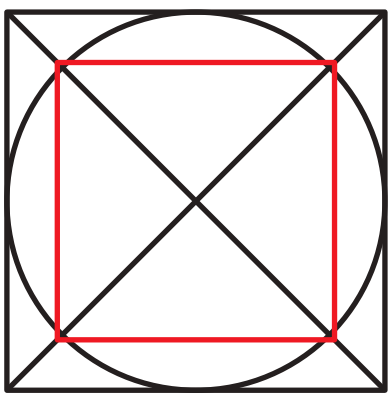


FIGURE 10.26
To make a matte box find the square inside the area of your lens opening by tracing your cap and using a pattern similar to this.

The process: working with a body cap

1. Find the center of your body cap. The easiest way to do this is to put the cap on a piece of paper and trace its outline. Then, using a ruler, draw a square around the circle you have made. Draw diagonal lines from the corners of the circle. It should look something like Figure 10.25.
2. Cut out the circle, tape it to the body cap and, using a small-gauge drill, make a hole in the body cap. THIS WILL NOT BE YOUR PINHOLE. It needs to be large enough to not interfere with (vignette) the image but small enough so it is easy to cover up with the lens holder you will build. Remember, you can always make the hole bigger.
3. Using your black show card or manila folder or other thin, flexible cardboard, create a small pocket to fit on the body cap. If you did not completely destroy the pattern you made while drilling a hole in your body cap, you can use that as a sizing guide. If not, follow the instructions in step 1 and then continue by drawing a square that connects the legs of the X on the inside of the circle as in Figure 10.26. Cut out this square and then use it for a pattern to make your matte box. Keep the pattern! You will want to use it again to make your pinhole lenses!
4. Drawing an X over the matte box find the center and then, either using a hole punch or your blade, cut out the center of the matte box, much like you did in your pinhole still camera.
5. Make sure you matte box is completely black by painting it with matte black spray paint and touching up the edges of the center hole with a black Sharpie. Once it is dry you can mount

it to your body cap on three sides with black camera tape. Leave one side open to slip in your pinhole.

6. Using the same pattern that you used to create your matte box, trace an outline for your pinhole lens onto your aluminum. Add an extra inch or so on the side for a handle for your lens. Before you cut out the tin, find the center so that you can have a visual guide for where to drill. Cut out the piece of aluminum can or baking tin.
7. Drill your pinhole. Since a digital or video camera has significantly more flexibility in terms of light sensitivity and you will be able to see the results through the viewfinder and adjust the exposure accordingly, you don't need to worry about measuring as precisely, but you will still want to use a fine needle to drill the hole and you will want to sand it smooth and paint it carefully.
8. Once it is dry you can slip it into the matte box and begin experimenting.

You want to protect your sensor from dust and scratches. The best way to do this is to cut out a small piece of optically clear gelatin filter or a very low neutral-density (ND) filter and carefully tape it on the inside of the body cap so that nothing can get in through the pinhole. Also, when your pinhole lens/body cap is off the camera, protect the back end with an extra back-end lens cap. At the very least store the apparatus in a clean Ziploc bag.

Digital/video pinhole without a body cap

This is only for the truly carefree or to use with a camera that is past its sell-by date. That said, you can get some of the most interesting effects by building your own matte box mount to put over the lens mount that will allow you great flexibility with your pinholes. Basically, you are creating your own body cap with black show card and a gelatin filter on the back (to protect the sensor) and taping that directly to the camera. You can build your matte box onto that "cap" (see directions above; it is pretty similar) and build pinhole lenses accordingly. One of the most interesting uses I have seen with this kind of rig was the use of small slits in two lenses that were slid together and apart, creating extremely distinctive images. The image would go from recognizable when the lenses were together and forming a basic pinhole to unrecognizable as the lenses were pulled apart and the slit formed. Having a matte box rig with a larger open area also allows you to experiment with putting the pinhole somewhere off-center, having multiple pinholes and moving the pinhole. All of these create unique image sequences that are impossible to create any other way!

BIOGRAPHY OF THOMAS COMERFORD (FROM THE MASSART FILM SOCIETY WEB BLOG)

Thomas Comerford (b. 1970, Richmond, Virginia) is a media artist, musician and educator residing in Chicago. Trained in sculpture, performance and the classics, he began making films in the early 1990s. In 1997, he embarked on an influential series of films, made with a pinhole motion picture camera and home-made microphone, under the title *Cinema Obscura* (1997–2002). His recent films are site-specific to Chicago and explore the evidence, revision and erasure of histories in the landscape. His work has screened at many festivals and venues, including the Gene Siskel Film Center, Anthology Film Archives, San Francisco Cinematheque and the London Film Festival. Comerford has also toured the United States with his films, screening in spaces ranging from church basements and backyards to regular old movie theatres. As songwriter, singer and producer for the rock band Kaspar Hauser, Comerford has performed his music around the Midwest and eastern United States, and released three LP records. He currently teaches film production, DIY exhibition and punk rock history at the School of the Art Institute of Chicago.

INTERVIEW WITH THOMAS COMERFORD

Kathryn Ramey: The chapter that I am interviewing you for is about pinhole cinema and photography. This was a part of your cinematic practice several years ago and isn't any longer but I was wondering if you might reflect on what made you start making pinhole movies. Had you made still photographs this way? What was your process of developing this technique and who or what influenced you along the way?

Thomas Comerford: Yes, in 2002 I completed the last film (*Figures in the Landscape*) for what was a very loose series of films, all united by their production means and to some extent their concerns. So as I've moved onto other projects, ideas and idioms (my most recent film was 2010, and I've no plans to begin another any time soon), I haven't given much thought to this work that is over ten years old.

But I can tell you a few memories I have of how I started.

I think above anything else I was looking to capture a particular feeling via the image—something hazy and indistinct, and at the same time crude and rudimentary. I remember being really taken with Carl Dreyer's *Vampyr* when I saw it for the first time in 1996—it was a beat-up 16mm print that was probably a copy of a copy, and I was really taken with the oddities of the time–space relationships in the film but also how grainy, hazy and indistinct the images were—dreamy and ancient-feeling. I wanted to try to find a way to get a similar feeling. Another big influence on me from mid-high school on were ideas of DIY, coming from punk and post-punk scenes, especially at the time music made with really rudimentary means, "lofi" as it was called. Indie bands like

Beat Happening, early Smog and Pavement; Sebadoh provided a template for working within very limited technological means and having the medium be a part of the "style" that was being forged.

I think I cover my start in the zine, don't I? So be sure to look to the early pages in that too. Looking over Eric Renner's *Pinhole Photography*, I began to get an idea of how I might construct pinholes, and I lucked into a Bell & Howell DR-70 16mm camera. I decided to begin exposure tests by mounting pinholes onto that camera. This process started in 1996 and continued through 1999, with a variety of filmstock but two to three pinholes, which I began to get an understanding of how best to expose with. As far as subject matter goes, I pretty much just worked with whatever was around me and where I was living in Iowa City. I also brought the camera along on some visits to my parents' house (my childhood home) outside Cleveland, Ohio. Most of this collected footage was edited to form my first pinhole movie, *Fey Eyes Pin Holes Drums Hum* (1999).

KR: What is the relationship between the technology of pinhole cinematography and the subjects of films made in this manner? The films are political. In particular* Figures in the Landscape *(2002) takes up the idea of historical documents about the settling of an area of Illinois. Through what is included and what is left out, you remind us that indigenous Americans lived on the land before it was "settled" by Europeans. How does the technique of filming with a pinhole connect to the subject? (This is the age-old question/relationship of media and message.)

TC: That film (*Figures*) was filmed after I moved to Chicago—in a Chicago suburb called Schaumburg. That film, in many ways, was the beginning of a series of films that document my research and understanding of the history of Northeast Illinois, and, by extension, the history of the construction of the United States. By that point, I really loved the look of the pinhole images I was making, as well as the vocabulary I'd developed with the various sound devices and strategies I was using, but as the politics of the situation began to reveal themselves, after I completed that film, I decided to discard that approach and try to emphasize clarity and directness with my images and sounds in dealing with ideas of history, land-use and representation. So, in a sense, *Figures* felt to me that maybe it shouldn't have been made with a pinhole camera—the medium didn't really fit the message any more. Whereas earlier films like my tribute to Jonathan Crary's Techniques of the Observer (*ILLA CAMERA OBSCVRA*) and the tribute to Lumière (*Départ*) felt much more connective of concept to process.

KR: You completed several films with this technique and created a zine that you distributed to folks. What was the purpose behind making the zine? Did you get tired of explaining how you did what you did? Or was it connected to other cultural trends at the time like zine production in poetry or indie rock?

TC: The purpose of the zine was in some ways to provide a little more culture around the project. Also I am a teacher, and I taught students how to make

pinhole motion picture films up through the time I stopped making them. So I am very much used to sharing knowledge. The zine seemed a perfect fit, especially in connection with my interests in DIY culture and xerography. I started teaching at the School of the Art Institute, Chicago, in 1999 and taught an image-making course from 2000–2002 in which pinhole was part of the curriculum. I am still there but there's not much call to teach film-based production so I teach a lot of courses around non-fiction and cultural studies.

KR: You are also a musician and you continue to make films. What is the relationship between these two artistic practices? Have you ever toured as a musician with your films?

TC: These two practices have had a kind-of see-saw relationship over the last twenty years. Lately I've been very busy writing songs, recording and performing, and I'm just going with that. When I entered Iowa for grad school in 1996, I felt like I wanted to set aside music, for the most part, and really focus on being a filmmaker. Once I moved to Chicago, I felt that maybe it had been a mistake to become so specialized, so my attention to music started to creep back in. By 2007, I found the balance shifting towards where I'm at now. Teaching keeps my head/feet in film/moving pictures/art, but most of my creative time outside of work is dedicated to my music making. There's rarely been much overlap here, sorry to say. But one thing that I've purposefully done this time around (for the release of my new LP this year) is to work with filmmakers I really like and playing a role more as a producer and have them create music videos for my new songs. One of my favorite filmmakers in the world, Chris Sullivan, created the inaugural vid for the new LP this year, which premiered on the *USA Today* "Pop Candy" blog! There will be more to come too. [See www.usatoday.com/story/popcandy/2014/05/13/thomas-comerford-premiere/9034797/.]

KR: The film that we are including on the website is called Départ. Can you tell us a bit about how this film came about?

TC: The film was inspired by a railroad switchyard a block from my home in Iowa City. I shot it right before I left town for Chicago. Once I had the footage, I felt like I wanted to make more explicit the connection between my pinhole approach to filmmaking and the early films by Edison, Lumière. So it became a bit of a tribute film to Louis Lumière's *Arrivée*—and I even brought in a French-speaking narrator to play the "character" who's making and ruminating on the images of the trains.

KR: Finally, every interviewee has been asked to set the readers a task or give them a recipe. Some of these recipes/tasks are philosophical, whereas some are very practical. Would you contribute such a task?

TC: I'm not sure what to say. I think it's important to put things down after being immersed in them. Take a break. Walk away and come back. I think the creative process as a fever dream is over-romanticized—not that it can't happen, but it's rare. The "editing" process, where whatever materials you're working

with are considered and thought about, is something I've really grown to appreciate as part of a creative process. Making my new record and my most recent film benefited from this approach.

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CHAPTER 11

Gallery Work

Film as installation

Installation indicates pieces that are specifically designed to run on their own, with little or no intervention by the artist. These usually exist in gallery or museum spaces. In a way, the act of installing art transforms the way we think about space *into* a gallery or museum space and (usually) transforms the viewing experience from one that is collective—in the way theatrical/performance activity is—to one that is individual in which the viewer walks by/around/through the artwork and experiences it singularly or with a few others. Although film installations are ephemeral in a sense, as the art object only exists once it is installed and turned on, installing films for display into a gallery/museum is a move toward thinking about film as an art object that can be produced in limited editions, commodified and sold.

This is not to criticize the artists who work this way, but rather to say that the art world is good at commodifying art objects so that they can be sold and that this market is well established whether the artist who wants to produce these kinds of film works wants to engage in it or not (see Becker 1982 for a discussion of the socio-economic construction of an art world). The avant-garde film world is very bad at commodifying its work and artists who want to do so have been more or less successful in creating an environment of *scarcity* around their work that would increase its *value*, such that someone who collects art would find the purchase of a film a good *investment*.

The distribution strategies of Sharon Lockhart illustrate this difference. Working in both still photography and moving images, Sharon does not exhibit her films in festivals and other venues the way other filmmakers do (showing them as frequently as possible, thus reducing their scarcity) but has very select screenings and/or exhibits only in galleries and then sells limited edition prints of her films alongside her photography. I don't want to dwell on this too much as I and others have written about the economics of the film avant-garde (Bayma 1995, Ramey 2010), but bring it up to indicate both the economic and social/cultural forces that impact the viewing and distribution of this kind of film and installation work, and *should* impact how the artist thinks about his or her work as he or she is making it. Who do you want to see/experience your

work? What kind of economic experience do you want to engage in? Some of this is of course beyond your control, but understanding the field of possibilities of exhibition and distribution should be an essential part of your artistic production, even if you are only making films for your friends.

Film as installation has also a long history in the film avant-garde and continues to this day, despite the prevalence of video art. Film is a different medium and this interest in its media specificity in installation underscores this difference. To a certain degree installation with *film* utilizes similar tools to any other experimentalists working in film. In Chapter 1 there are instructions as to how to make a loop. I put them there for the purpose of folks working in direct animation to be able to "test" their animations, but film as installation almost always plays on a loop so that it can play continuously. Most installations play pieces that are longer than the 6ft or so that we discussed in making a test animation. Films for installation can be several seconds to thirty minutes or more. Many artists use the standard 16mm projectors with various rigs built above the projector to allow the film to loop through the projector and play continuously. These rigs are called "loopers" and are often built to order to accommodate the length of the looped film, although a company in New York, NCS Products, makes 16mm mini and "super" loopers (Figure 11.1). For installation the film itself is generally printed onto Estar instead of acetate because Estar (as in polyester) is much more durable and can withstand the hours of continuous projection that are required.

Others create loops that are spatial and sculptural in that they involve a consideration of the gallery space with rollers hung from the walls and ceilings. In the piece by Karen Mirza and Brad Butler represented in Figure 11.2, the

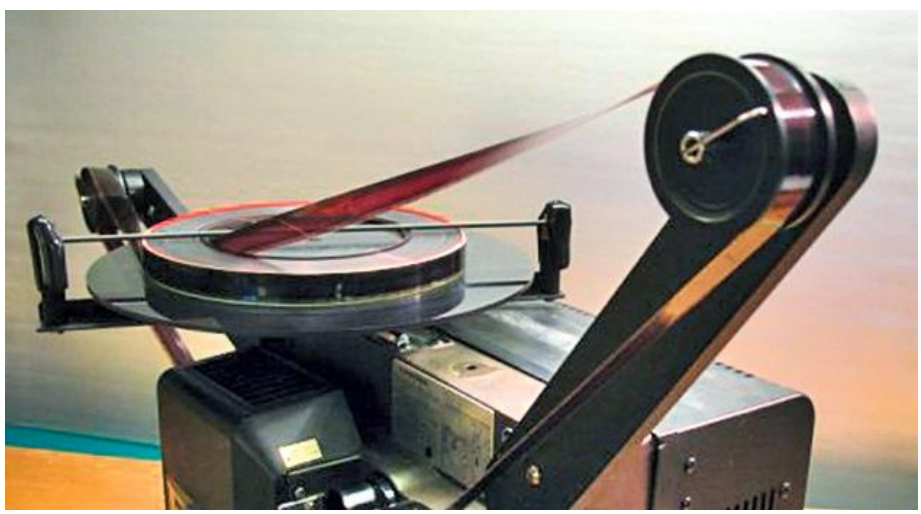

FIGURE 11.1
NCS Products Super Duper Looper™, courtesy of NCS Products, New York, NY.

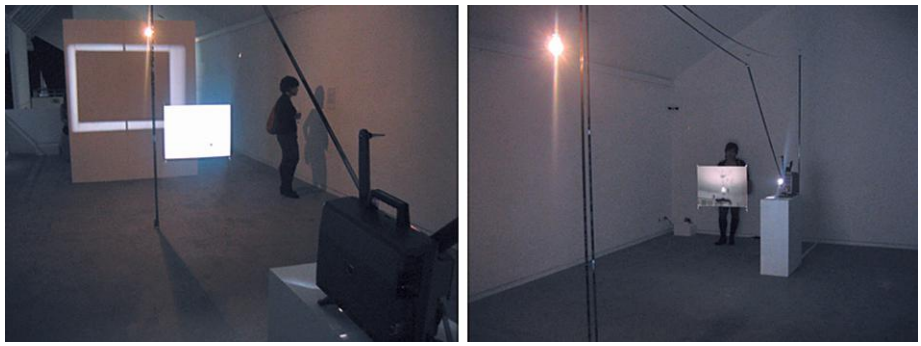

FIGURE 11.2
Documentation of the work *Untitled* by Karen Mirza and Brad Butler. Courtesy of the artists.

space is the central consideration for the way the work is designed. From their website:

> The physical film strip defines the shape/volume of the actual space in which it is displayed. The planes are clearly defined and mapped out in both space and time, from the film plane as the filmstrip passes by the projector gate to the image bearing light resting on the surface of the photograph which stands in as the screen, to the surface of the filmstrip as it passes in front of the light bulb hanging in the space to the double projection of the shadow of the illuminated screen hitting the back wall.
>
> **www.mirza-butler.net/index.php?/project/untitled/**

Some artists machine all or part of the projection apparatus themselves (or have it machined) so that even the projecting device is a sculptural element, or they rework the environment so that it becomes a sculptural element to collide with the film. A member of the Double Negative Collective in Montreal, Malena Szlam works in a variety of media for her films and installations. She has used both more conventional film and video projection, although nearly always in multiple screen projection, and in her piece *Chronogram of Inexistent Time 2* (Figure 11.3) she redesigned the walls of the space to create a three-dimensional screen for her images to project on. In another piece by Szlam, she mounted 35mm gates and lenses onto plexiglass and then the gallery walls. Film loops strung around the room between the gates and the entire apparatus would "turn on" when someone entered the space and set off a motion sensor. The piece *Una esfera, cuyo centro está en todas partes* ("A Sphere Whose Center is Everywhere") is both sculptural and produces extraordinary visual sensation through interaction.

Although film as installation does not occupy a large section of what we would consider the yearly output of experimental film worldwide, it has a long and established history. It has occupied dual citizenship between art and experimental film spheres of influence and the mainstream art world. International

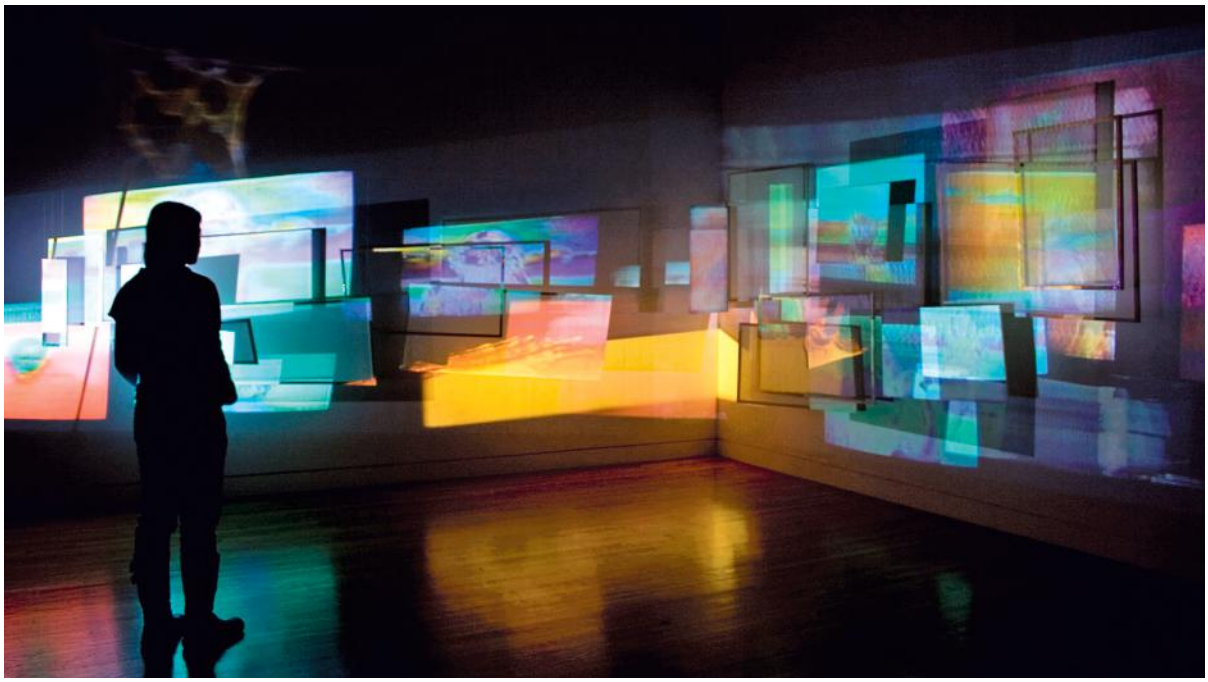

FIGURE 11.3
Chronogram of Inexistent Time 2 by Malena Szlam. Image courtesy of the artist.

art star Tacita Dean (see the introduction of this book), though she works in 16mm and 35mm, eschews film festivals and only exhibits her films at galleries and museums. It was her 2011 Turbine Hall piece *FILM* at the Tate that caused the kerfuffle around all the commercial labs being closed in Britain, and if you watch documentation of the exhibit or listen to interviews around it, she gives a fairly reasoned explanation as to why film is her medium and access to it must be preserved.

Film as installation has been a part of experimental practice for at least fifty years. Paul Sharits, Stan VanDerBeek and Carolee Schneemann, among others, were mid-century filmmakers who created film-based installations. In the early 1980s the Museum of Modern Art in New York had two exhibits of film as installation. Although at the time they included artists working in both film and video, video art beginning in the 1960s emerged as a distinct format and eclipsed the output of film in moving-image installation by the mid-1980s. Nevertheless as Dean and Lockhart show, and the artists interviewed in this chapter will attest, there is still space, perhaps growing space, for celluloid as installation in the art world.

Film as installation requires mechanical projectors, prints that can withstand being projected over and over again for days on end, and some sort of looping mechanism that allows the film to feed back into the projector so that it

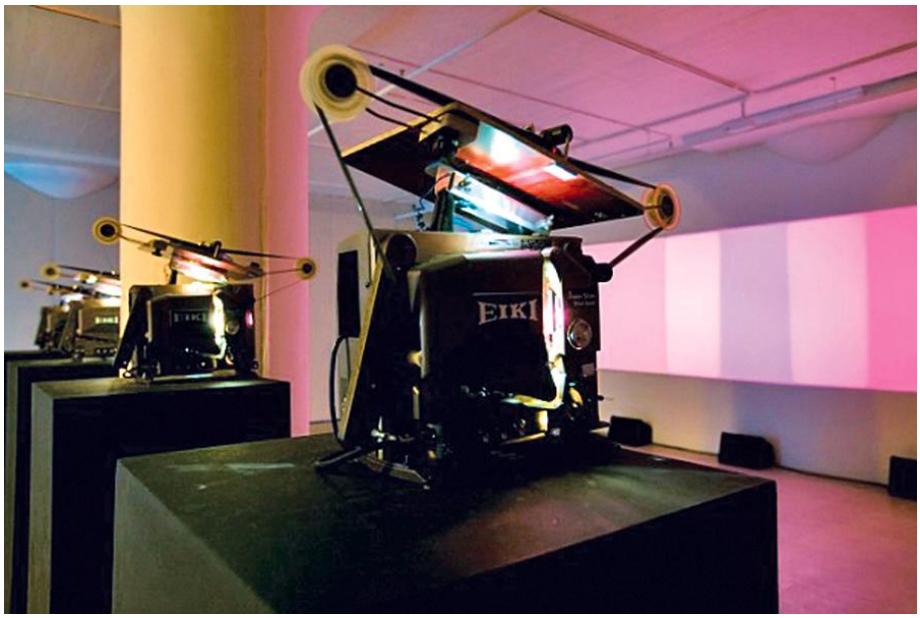

FIGURE 11.4
Paul Sharits, *Shutter Interface* (1975). From the Hirshhorn Collection.

constantly replays. In addition, if you have a multi-projector installation, it is necessary to sync the projectors so that they run in time with each other. An artist who wrangled with these problems and about whom there is significant documentation is Paul Sharits. In particular his *Shutter Interface* (1975) has been preserved at the Hirshhorn Museum and Sculpture Garden as a part of the Smithsonian Institution collection. They use the film as a case study for the challenges of preservation of time-based media artworks (www.si.edu/tbma/hmsg_sharits) and provide a link to watch a recording of the display (www.youtube.com/watch?v=Syjw1hJAADg).

Figure 11.4 is an image of *Shutter Interface* from the Hirshhorn galleries press release. There are four film projectors set up side by side with their areas of projection overlapping by about a third. Thus the center two panels are overlapped on the left and right, and the left- and right-hand panels have only one side of overlap. Each film is composed of various solid colors that cut rapidly from one to another. These solid colors are interspersed with frames of black. The four films are all of different lengths and so, once the projection begins, they provide a seemingly infinite loop of combinations. The piece is elaborating how the shutter in cinema functions to interrupt light and create a flicker, and is an expansion on Sharits's other flicker film work.

Since I began teaching experimental work at Emerson College I have had a handful of students make films as installation. There was one student whose project was quite memorable for the size and scope of its imagination. He was one of our very first experimental media majors and he wanted to make what sounded to me like a "dream organ". Much like a "color organ" from the

19th century that would play sounds that were meant to correlate with specific colors, John Tyson (the student) wanted to create a huge analog contraption that would access specific film loops that corresponded to certain dream archetypes. He said about the piece:

> This piece sort of grew out of a need or curiosity of mine to explore dreams and the dream-state. For whatever reason, I very rarely remember my dreams, and when I do it's always just very briefly before waking up. So I decided to interview a bunch of my friends, and anonymize their dreams into abstract elements that could be recombined in different ways as a sort of "lucid dream machine". Originally, the plan was to produce it all on 16mm and play it back using multiple projectors—but it became clear that, aside from the budget that would've been required, logistics would have been difficult (not to mention how loud that many projectors in one room would be). So we decided to produce it digitally and run it off a Mac Pro, which opened up a much bigger degree of interaction from the viewer, as well as different presentation options. I decided on the single projector with dual monitors because if you stand in the "sweet spot" it feels like the monitors fill up your peripheral vision just right, for a "VR without a derpy headset".
>
> **Email with the author**

The piece was called *Luziden: In dem Träumenden Gehirn* and he described it as:

> An interactive video triptych by media artist John Tyson that plunges the viewer into the surreal world of lucid dreams. Created using concepts and material from actual dreams gathered by the artist, *Luziden* allows the viewer to produce a unique visual and aural Freudian dream-state through interaction with a MIDI keyboard. The images are composited in real-time and displayed using two LCDs and a projector, in 720p HD video. It is the artist's attempt to negotiate the psyche of the individual as it meshes with the Jungian "collective unconscious".

Because film as installation and performance is less about specific techniques and more conceptually based, and utilizes a variety of material processes already delineated in this text, this chapter is focusing less on instructions and more on interviews. It is my hope that the interviews provide a spectrum of perspectives from which these moving image artists make and exhibit their work that prove inspirational. The chapter will include one or two concept exercises by the artists to get you thinking as well as two very loose "assignments" at the end for you to begin your exploration. Although I've mentioned a number of artists (most of whom I've actually met) I wanted to include two people whose work I've known for a long time and who have worked in both linear pieces intended for exhibition in a cinema-type space and in creating works for installation and gallery-type distribution.

FIGURE 11.5
Gallery attendee playing *Luziden* at the Huret and Spector Gallery, Emerson College. Image courtesy of the artist.

FIGURE 11.6
Luziden, the "Dream Organ". Image courtesy of the artist.

Joel Schlemowitz is an artist I first met in the mid-1990s when we both worked at the University of the Arts (with Peter Rose) in Philadelphia. At the time Joel was making films for theatrical exhibition and he was a part of a microcinema called the Robert Beck Memorial Cinema, screening out of the Theater for the Collective Unconscious on Ludlow Street in New York. The group was begun by friends and filmmakers Bradley Eros and Brian Frye (whose *Oona's Veil* is discussed in Chapter 1). Joel and I stayed in contact and I ended up interviewing him for my dissertation in Anthropology. I interviewed him in the Long Island City warehouse studio space he shared at the time with Frye, Bruce McClure and a couple of other artists. I remember he had the guts of a piano there as well as a bunch of other interesting ephemera. In my research I was really interested in what kind of upbringing caused a person to become an experimental filmmaker. So I asked Joel if there was something his parents did that prepared him and he said (I am paraphrasing), "It's not that they brought me up to be an artist, but rather that the way I was brought up made it almost impossible for me to be anything else." Being an artist is a very particular calling and people come to it in all sorts of ways, but his words have rung in my head ever since. This idea of a certain set of material and social circumstances that don't point a person towards becoming an artist but rather point them away from other "professions" until being an artist is somehow inevitable: it's a different way of looking at fostering a particular career in a child.

Joel and I have kept in touch over the years and several years ago he began making work for gallery installation and exhibition. He has made all kinds of optic-related artworks, everything from zoetropes, stereovision hand-held devices, film boxes and film installations. I have included a selection of images from a variety of projects to give you a sense of the works we are talking about in the interview. His biography and a short interview are below.

BIOGRAPHY OF JOEL SCHLEMOWITZ

Joel Schlemowitz is an experimental filmmaker based in Brooklyn, New York. He was the recipient of a Puffin Foundation grant in 2013. Solo shows of his installation works have taken place at Anthology Film Archives and Microscope Gallery in Brooklyn, New York. Solo film shows include the Museum of Modern Art's Cineprobe series, Millennium Film Workshop, the Robert Beck Memorial Cinema, Anthology Film Archives, Experimental Response Cinema and the Northwest Film Forum. Screenings of his films have included the New York Film Festival, Ann Arbor Film Festival and Tribeca Film Festival. His work has received awards from the Chicago Underground Film Festival, and elsewhere. Schlemowitz writes about experimental film for the poetry and arts community newspaper, *Boog City*. He is currently working on a feature-length experimental documentary on 78 records. His website is: www.joelschlemowitz.com.

INTERVIEW WITH JOEL SCHLEMOWITZ

Kathryn Ramey: When last we talked (1999 I think) you had not really begun the installation work. So it makes sense to begin the discussion by asking you, how did such a practice evolve? What was it about how you were working in linear form that suddenly made you look towards installation?

Joel Schlemowitz: My drift towards creating installation works in addition to my films came slowly and in stages. The very first pieces, made with toy Super-8 viewers, were as much little gifts for friends as artworks. But I became intrigued by this alternative form of viewing the work. Much more similar to the Edison Kinetoscope, with a single viewer at a time, and the presence of others waiting their turn having a sense of anticipation and intrigue as they observe the reactions of the person peering into the machine without knowing the images provoking the reactions. There's something appealingly mischievous about this in some way, because seeing someone look into a peephole often suggests a slightly lurid image on the other side when we can't see what it is.

In 2000 I discovered Anthology's gallery space as a potential venue for works off the screen. It's a shame they had to eventually abandon using that basement space for installation and other artworks because there were some wonderful exhibits there including photographs by Robert Haller, video installations by Takashi Murata during the New York Underground Film Festival, and exhibits that every so often related to work that was being shown in the theater above. What I view as the culmination of this was the "Grand Magic Lantern Exhibition!" taking its title from a vintage flyer from the late 19th century that I acquired along with a tin magic lantern from eBay. This consisted of seven 16mm film projectors, projecting onto mirror balls to throw a spray of images around the walls of the space, the footage being images from magic lantern slides. There was also a Victrola to provide a soundtrack, and an oriental rug and brocade pillows on the floor for viewers to make themselves comfortable in viewing the work. The loops themselves were only about 10 seconds apiece, but shot with short cuts and movement so as to hold up to a few viewings without getting dull. There was some thinking in creating the work in this manner of some of the shortcomings of showing more linear or long-duration work in the gallery setting. You can't really control when the viewer comes along and I've seen so many instances of gallery shows where people will walk in during some odd point in a loop being presented, not be able to engage with it, and walk off after a short while. Or if they stick with it they'll just wait until they've gotten to the "this is where we came in" moment and will have watched it rather disjointedly. I think there's a sort of non-linear and non-durational approach to the film loop that plays to its strengths a little better, and that's one of the things that I was after with this piece.

The camera-paintings are something that evolved around this same time, realizing that the physical strip of film was hiding a series of images through time that could be viewed simultaneously rather than sequentially. And when

the panning or tilting camera was used, you had a view of both time and space, and a relationship between them. And so I would shoot with the camera moving, and then rack it over to do another strip that would be next to it and assemble an image in a light box from all of these strips of images. They turned out the most satisfying when they didn't line up perfectly but had some overlap, creating an image that would feel a little bit cubist in nature, on the cusp between abstract geometry and recognizable object. It turns out I was by no means the first person to discover this technique. Ross McLaren had shot and assembled 16mm film strips in the same manner back in the 1980s.

Most recently I've done 3D collages that are looked at with old stereoviewers to produced the three-dimensional image, shown back in the spring at Microscope Gallery. As with the film-boxes and their Super-8 viewers there's something interesting within the gallery setting of having the experience of the work be singular in a very different way than the singular viewing we do at home, looking at things on a computer. It's the interaction between people, waiting to take turns, observing the person peering into the stereoviewer and imagining what they might be seeing.

The most recent of recent pieces is on view right now at Microscope Gallery's SLIDE SLIDE SLIDE. A piece using 35mm slides and rear projection screens. I've used these screens in the past for rather ephemeral art pieces at events (sadly, with little documentation of them back then). And it was one of those lucky moments of happenstance that just as Microscope Gallery was planning a show of work involving slides, the Art History department at Parsons decided it was time to finally get rid of their 35mm art history slides, which had all been digitized at least ten years ago.

I'm working on a new form of 3D pieces now, again using repurposed old technology, but this will not really be ready until some time in the spring. In the meantime, I'm also working on some new camera-paintings that use people in motion to further merge the boundary between the abstract and representational qualities of the work.

KR: How did your installation work then impact your linear work?

JS: There's often a perceived separation between the "white box" gallery and the "black box" cinema. But I'm interested in the places of convergence of the two. The gray box? Or maybe Holstein cowhide box? This is what I enjoy about places like Microscope Gallery in Bushwick, Brooklyn, with their mandate to link these two often separate worlds. I think this isn't just about the different groups and the sense of provincialism that can sometimes exist (back when I would go to poetry readings with my partner, the poet Wanda Phipps, there were people who were surprised to discover I wasn't another poet), but also the need to think about the different modes of working and their different experiences. What I mean by this is an impatience with gallery spaces that will just throw a video projector up and have work play on a loop, maybe even with the added indignity of having sets of headphones to hear the soundtrack.

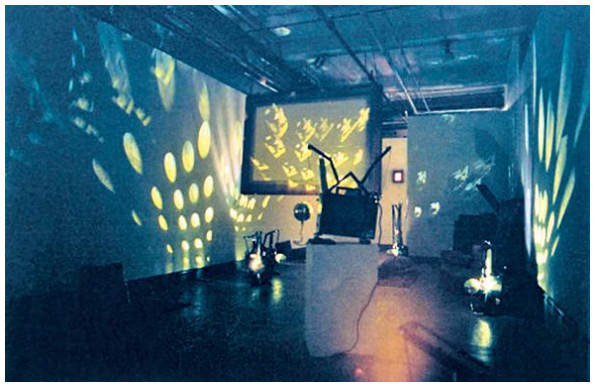

FIGURE 11.7
"Grand Magic Lantern Exhibition!" at Courthouse Gallery, Anthology Film Archives, 2003, by Joel Schlemowitz. Courtesy of the artist.

FIGURE 11.8
"Cine-paintings", 2012, by Joel Schlemowitz. Courtesy of the artist.

FIGURE 11.9
"Parallax Reveries" stereoscopic collages at Microscope Gallery, 2014, by Joel Schlemowitz. Picture courtesy of the artist and Microscope Gallery.

FIGURE 11.10
"A Gallery of Ektagraphic Elegies" from SLIDE SLIDE SLIDE at Microscope Gallery, 2014, by Joel Schlemowitz. Image courtesy of the artist and Microscope Gallery.

Really giving little thought to how the work should be experienced. I've never had film pieces shown this way (unless it was without me knowing that it was being done this way). I think it's a bit of "form follows function" to utilize different viewing experiences in careful, well-planned ways.

KR: You have a variety of installation pieces, from "optical toys" to zoetropes to viewers and rewinds, to multi-projector installations, to film boxes. Can you talk about each of these types of works and how you came to develop them?

JS: The Super-8 viewers used in my early film boxes turned out in retrospect to be a challenging entry point into creating film installation works. They've got a tendency to jam and malfunction—after all, it's just a crude little toy viewer—and so everything after that became easier. Some of this I've addressed earlier.

But perhaps it's a good juncture to say that I find there's a careful balance that sometimes needs to be achieved between the apparatus and the image. Especially with things like 16mm film. I've gone to installation shows where the audience was mesmerized by the mechanical nature of the apparatus and pretty much ignoring the projected images. And so there needs to be some consideration of how much you obscure or reveal the apparatus. A good example of finding just the right place for this was a show by Matt Town at Microscope where he had a loop of 16mm film of the construction of a soap box derby car, then seen prowling along the street, with the projector placed inside a white box that echoed the form of the soap box car itself, and yet provided just enough hint of the apparatus through things like the sound of the projector to be a well-executed balance between the projector and the image where you were attentive to the film but also could see something interesting in the apparatus.

Then there are some cases where the apparatus itself is more critical than the projected image. One piece I recall fondly as an example was a show called "Machine Gut" put together by Katherine Bauer. It was all about the projector as sculptural object—on purpose and not by accident.

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

JS: Where do ideas come from . . . ? Do any of us truly know the answer to this?

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

JS: I'm interested in the process of working with film and other media technology where there is a reciprocity between the media and the creative process. That is to say, not a version of creating work where it is a headbirth, conceived in some ideal realm of thought and shoehorned onto the form it takes in the real world. But (as I remember reading in a quote from the filmmaker Sam Wells) there is a dialogue between the medium and the artist, the filmmaker tries something and the film says this is how I'll react if you do that. And then comes that moment of realization that there's a potential way to work with that reaction in some interesting way. An engaged way of working that acknowledges the medium's wealth of possibilities. Installation work is just an extension of this question.

The work is about many things, but I'm probably more interested in discovering how the works mean something to others than to explicate the meanings. It's a bit like trying to explain the joke. This might sound like a cop-out, but talking about what the work is about can often sound a bit hubristic coming from the artist him-/herself.

> Explaining humor is a lot like dissecting a frog, you learn a lot in the process, but in the end you kill it.
>
> **Mark Twain**

The second artist I interviewed for this chapter also works in a variety of forms. For installation, she produces drawings and animations, as well as her film loops. I first met Jenny Perlin through Robin Cline, the friend I mention in the acknowledgements. They were both studying at the School of the Art Institute of Chicago. I also interviewed Jenny for my dissertation and she was generous enough to submit to this most recent round of questioning! Jenny's practice has always involved installation work, although at times she has also engaged significantly with exhibition in festivals as well. She works very fluidly across animation, film and video, and much of her work centers around what might be called "documentary" or non-fiction interests. She has a passion for research and her work draws on a strong interest in history, language and culture. It is also quite beautiful. One of the things I have most enjoyed communicating with Jenny about as we've worked on this interview is perhaps rather mundane. She, like me, is a mother of young children and this experience of working with, in, around these circumstances is nice to share.

BIOGRAPHY OF JENNY PERLIN

Jenny Perlin makes films, videos, installations and drawings. Her projects draw on interdisciplinary research interests in history, cultural studies, literature and linguistics. Her films incorporate innovative techniques to investigate history as it relates to the present. Perlin shoots 16mm film and digital video, and combines live-action, staged and documentary images with hand-drawn, text-based animation. Her films have been shown as single-channel works and multi-channel installations at numerous venues including the Guggenheim Museum (2011), Mass MoCA (2011), MoMA (2007), Guangzhou Triennial (2008), IFC Center (2008), Berlin and Rotterdam film festivals (2003–2007), the Drawing Center (2001 and 2008) and the Kitchen, New York (2006). Support has come from the LEF Foundation, NYSCA, Experimental Television Center, CEC Artslink, American Center, Geneva, and the Arnold Foundation. Artist residencies include IASPIS Sweden, Wexner Center, Civitella Ranieri, ISCP and commissions from Bard College CCS, Aldrich Museum, BAC Geneva, the Queens Museum and Expo 02, Switzerland.

She received her BA from Brown University in Literature and Society (Modern Culture and Media), her MFA from the School of the Art Institute of Chicago

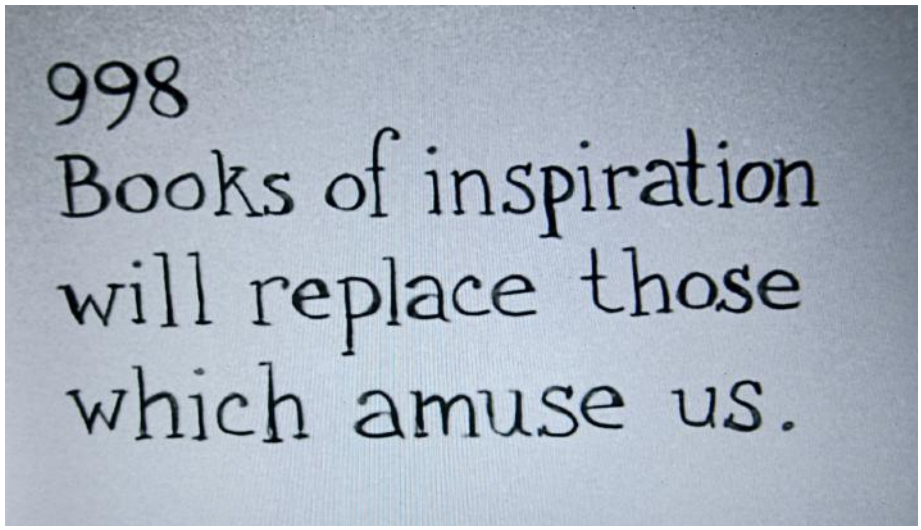

FIGURE 11.11
Still from *A Thousand Sentences* by Jenny Perlin, courtesy of the Simon Preston Gallery. Jenny Perlin exhibits a 16mm film derived from the work of Caleb Gattegno, a mathematician and educator who pioneered a visual systematic method for teaching foreign languages and mathematics. The film begins with hand-painted animated color fields, each corresponding to a vowel or consonant sound of the English language according to Gattegno's system. The second part of the film animates excerpts from *A Thousand Sentences*, Gattegno's book written to function as a primer for English learners to practice reading simple texts.

in Film, and completed postgraduate studies at the Whitney Independent Study Program in New York.

Perlin's work is in public collections including MoMA, Seattle Art Museum, the Five Colleges, MA, the School of the Art Institute of Chicago and numerous private collections. Galleries Annet Gelink and M+R Fricke represent her work in Amsterdam and Berlin. She is currently teaching at the University of Pennsylvania, the Cooper Union and the New School in New York.

INTERVIEW WITH JENNY PERLIN

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a new media practitioner, a shaman, a performer? How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

Jenny Perlin: Over the years it has been increasingly strange to put a name to me in relation to what I do. So rather than say I'm an artist or filmmaker or such, I say "I make films and drawings, mostly." When I try to explain to people what I do, I tell them I make films and drawings that have to do with history,

with the passage of time, with literature, poetry, music; and with the connections among them. Then I usually give a concrete example from one or another of the projects and try to keep it simple.

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

JP: I came to my practice from a deep interest in interdisciplinary work. Choosing film (coming out of literature and history studies) I wanted to find a way to work with all the forms I held near and dear: photography, voice, sound, music, light, reading, conversations, movement, ideas and story. Film seemed the most logical choice. Sixteen millimeter film because that's what was available then and I immediately felt a connection to that particular medium's mechanical and historical time period, as that was an area I had been working in in my other studies of late 19th- and early 20th-century literature. I also wanted to do something with my hands, to learn to use tools and particularly I wanted to be a woman who learned to use these tools of image and sound-making. That was important to me. After many years in the more traditional experimental film world I realized that I wanted to be part of an art world that was connected to the questions I was more committed to; less about narrative or storytelling and more about ideas and images and new ways of communicating with and about the medium. I had a harder time with the narrow exhibition formats afforded to the non-traditional films I was making and was far more interested in exploring multifaceted ways of getting my ideas across; not wanting to be limited by one medium or another; wanting to use the medium consciously and not as a transparent "window on my world"; I hoped to make it part of a larger set of questions. Using hand-drawn text animation came first from some drawings I had been doing about the war in Kosovo and then migrating them into 16mm came from several other influences. I was interested in bringing text into film in a way different from voice-over and also different from title. I wanted people to labor to read the film, and to consider that shared labor of reading a shared experience of reading a film; taking time to read together; a process. That's what brought me to the hand-drawn animation. The crudeness of the animation and its flatness also appealed to me at that time (this was 2000, 2001) because I was utterly sick of what I at the time felt was a lack of the ability of representational images on film to communicate anything except the most banal or clichéd of meanings. I wanted to return film to its flatness, to its "expensive plastic" state and to make it flat as paper and forget about that illusionism. I wanted to make meaning by adjacencies and associations (I was really influenced by Vertov even more than now) and not by the illusion of depth of image, character and a very specifically regulated kind of storytelling that did not appeal. I've mellowed with these strong feelings over the years and now integrate live-action with the animated films and also make live-action films in their own right, but this is some of the idea where this kind of work came from.

FIGURE 11.12
Jenny Perlin, *Funes*, Simon Preston, New York, March 4–April 15, 2012. *Funes* is based on Jorge Luis Borges's short story about a young man who gains an infallible memory after being thrown by a horse.

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

JP: Well I always have to answer to the "problem" of using an obsolete technology, and one that becomes sculpture when exhibited. There is a strong relationship between the themes and the medium of most of my work; for example, many of my films are "set" or take place around research in the early and mid-20th century. So film made sense for those. And there is an interest in the medium of film and the typographic typewriterly noisy mechanical quality of the projector and camera as it is made and exhibited. I like the feeling of "wrongness" that comes when watching a mechanical device (projector) work hard to project something that is obviously hand-made and flawed and not mechanically made. But I also make films in HD and in other video media and edit them on the computer and show them digitally when the idea and the project necessitate.

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

JP: I mostly show my work in a gallery or museum exhibition format, though I also show it in film screenings and it is also all available for viewing online.

I am interested in the different receptions of the work in the different media, less online because I feel that is more a reference form than an exhibition form for my work. But I love the different reception in a film festival when the space is dark and quiet, and in the gallery when people are moving around. I'm interested in and committed to continuing to explore the tension between these ways of exhibiting.

KR: Are you part of a community of makers (either locally or internationally) who communicate with each other about their work and get together either virtually or physically to discuss/show/celebrate? Where? When? How? What happens?

JP: Yes, I feel so lucky to be part of a great community of interdisciplinary makers, including artists, poets, musicians, fiction and non-fiction writers, documentarians, narrative filmmakers, experimental folks, activists, curators, pedagogues, scholars and my husband and kids. I've had a great group that met regularly in a salon format locally to discuss work, and lots of correspondence through virtual means. I feel delighted to know such a diverse and gifted bunch of people, and we all support and exchange with each other regularly.

KR: You know, that is a really important aspect (for female and enlightened male) artists of our generation. In the good ole days artists either didn't have families, ignored them or (and we all know who we are talking about) used

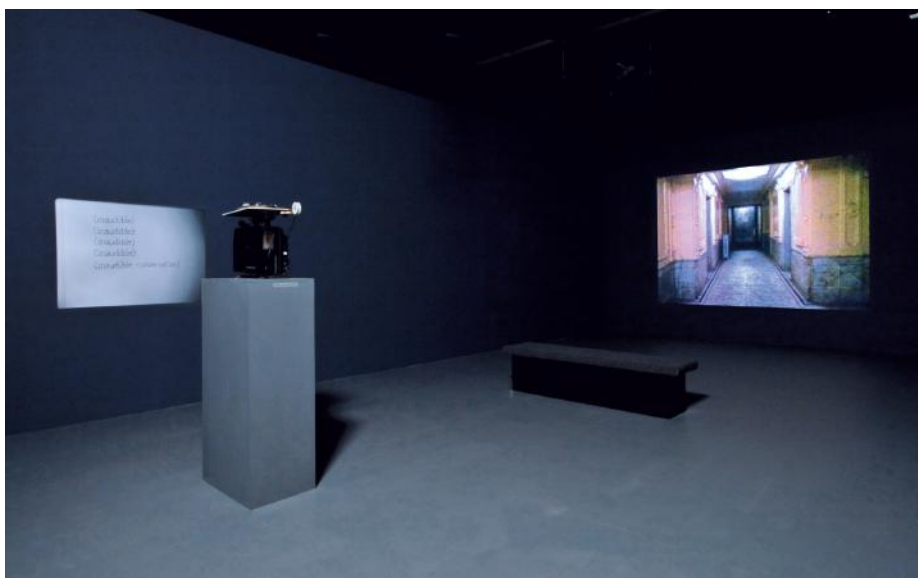

FIGURE 11.13
Jenny Perlin's *Transcript*, The Kitchen, New York, NY, 2006. The two works on view evolved from the artist's research into now-public FBI documents of secretly transcribed conversations from the Red Scare of the 1950s.

them as their "muse"—pointing the camera AT them but not really having them central to their artistic practice. Can you talk about the role(s) your partner and kids play in your art making? What do they bring to your work that is distinct and wouldn't exist without them?

JP: OK, now I'll answer your next question about the family thing. It is interesting to see artists with kids now, finally, in the US culture. That is part of a much longer conversation we can have in person, particularly the one child vs. two (or more) which is a big difference (as you now know!). My work got a lot better and I got a lot better as an artist once I had children. Even though I have only a scrap of time and am doing more "family administration" than I ever imagined possible, my work immediately got more colorful (literally) and more open once I had my children. Having kids freed me up from taking myself and my work so seriously, and certainly there's not a second to agonize about the work when there are rashes to be dealt with. My partner has always been part of my art-making process; though we don't collaborate, we do discuss and that is extremely useful. I do wish I had more time to travel with the work and also to fully immerse myself in a project; however, I wouldn't ever trade this feeling of freedom and flexibility and expansion that's come as a complete surprise and bonus to me after having had my girls.

Jenny Perlin's thought experiment

Take the receipts out of your wallet, or wherever you keep them. Look through a few. Don't put too much thought into which ones. Read them closely. Sometimes there's a worker's name. I have one that says "you were served by Shenton". Try to imagine Shenton, or the person on your receipt whose name you now know. Can you remember her? Try to imagine the day this person had. What she had for breakfast. What time she got to work, what time she might be done; some conversations they may have had or the conversation you may have had with her. Or perhaps there's something you want to ask her now?

Look again at your receipt. Imagine the person whose job it was to enter all those numbers and words that categorize the things you bought into the machine that printed it out. Imagine who decided how the things that are listed there got organized. Then try to picture the person who made the machine that printed the receipt. Continue apace.

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CHAPTER 12

Film as Performance

Gallery/theatrical

Film as performance occurs when the artist engages/interacts with the projection experience as it is happening. Such actions can take place in a variety of spaces from traditional theaters to classrooms, auditoriums, gallery spaces, museums, outside viewing areas, basically anywhere a filmmaker can set up screen(s) and have electricity to power his or her projectors.

Film as performance has a fairly long history from Méliès's initial experiments to incorporate film into his magic shows, to the films made to screen with/alongside avant-garde performances such as René Clair's *Entr'acte* (1924), which played in two parts during a ballet based on a book and with sets designed by Francis Picabia, with music by Erik Satie. Malcolm Le Grice created a performance with three overlapping panels of projected film called *Horror Film* (1971). With his naked back to the beams of light he moved away from the projectors as color mapped the contours of his form. Carolee Schneemann completed her film *Viet Flakes* (1965) initially to screen as a part of her performance *Snows*, a criticism of the Vietnam War. The film went on to have a screening life of its own and can be rented from the filmmakers' cooperative in New York City.

Stan VanDerBeek created his *Movie-Drome* (1963), a large, circular, domed screening space with multiple-format projections including slide and motion picture projection. The dome had a small entrance and the interior was all white with films and slides projected all over the walls in various sizes and speeds. The audience was invited to come in and sit or lie around the dome on pillows. There was sound from various sources but the acoustics of the dome was such that one could hear an audience member who was directly across the dome as though he or she was sitting right next to you. *Movie-Drome* was an immersive experience or what Gene Youngblood referred to as *expanded cinema* and I first read about the project in Youngblood's book of the same name. In 2012 the New Museum recreated *Movie-Drome* for its exhibition "Ghosts in the Machine". You can see interior and exterior shots from that exhibit in Figures 12.1 and 12.2.

FIGURE 12.1
An interior from the recreation of Stan VanDerBeek's *Movie-Drome*.

FIGURE 12.2
An image of the exterior. Courtesy of the New Museum, New York, NY.

Another artist who pioneered film as performance was Ken Jacobs and his *Nervous System Performances* (1975–2000) and *Nervous Magic Lantern Performances* (beginning in 1990 and originally titled *Nervous Magic Lantern*). In the *Nervous System Performances* Jacobs makes use of two analyst projectors focused on the same frame (so that the images overlap), projecting a copy of the same strip of film, usually out of sync, through filters and with an exterior shutter (a fan in front of the beams emitted by the projectors) creating pulsing three-dimensional experiences. The images selected are always "found" and always old, and the performances are often silent but for the sounds of the cinematic apparatuses, although sometimes there is found audio as well. In these performances the audience could see and hear Ken and Flo Jacobs as they manipulated the projectors and devices. With the *Nervous Magic Lantern Performances* the Jacobs were concealed within a light-proof enclosure. They still manipulated the images with a variety of interventions between the projected beam and the screen, but the mechanics were hidden (for a better description of the differences as well as details about particular pieces, see Pierson and Arthur 2011). I first saw a *Nervous System Performance* at the Donnell Library in New York City in the early 1990s. It was quite a revelation as I had never seen anything like it. Jacobs seemed to be manipulating the projectors and lenses and filters as though he was playing a musical instrument, a great organ of color and light.

What is different when seeing a live film performance and either an installation or film screening is that the interventions of the performer in the work make each experience unique. The performances cannot exist without the artist, at least not in a meaningful way. Representations and reproductions of performances, as faithful as they try to be, are still very clearly flat documentation. Although they may *point to* the body/mind of the artist in the performance of the work by including documentation of set-up, or a wide frame taken from behind the projection so that the artist can be seen and the sounds of the performance heard, they at best allow you only to imagine what the experience would have been like as opposed to recreating it.

Movie-Drome was installed next to VanDerBeek's house in Upstate New York, hosting a handful of screenings from 1963–1966. *Viet Flakes* was screened as a part of the performance *Snows* in 1966. The *Nervous System Performances* took place in the 1980s and 1990s. Since the beginning of the 21st century there has been a significant groundswell of individuals incorporating film (celluloid) as performance into their artistic practice. Some contemporary filmmakers who do so or have done so in the recent past are Devon Damonte, Lauren Cook, Ben Russell, Luis Recoder and Sandra Gibson, and Roger Beebe, among others.

The level of structure for the performances can be extremely rigorous, with specific formal/aural/image relationships happening similarly each time, or more of an embrace of the process/material and chance interactions. The individuals above all use different formats (Super-8mm, Regular-8mm, 16mm, sometimes even 35mm and various video) and they engage with sonic experience

FIGURE 12.3
This is an Elmo channel-loading projector that I purchased at a swap meet in New York City I attended with Jeff Scher in the early 1990s. Su Friedrich borrowed it to show rushes to the crew when we were working on *Hide and Seek*. Although I have many projectors at this point, this one is special to me because of its social history.

in different ways (sometimes using sound on optical tracks, sometimes using sound from other sources, sometimes, as in the case of Ben Russell's 2011 performance *cloenda Xcèntric* (see http://vimeo.com/49367647), using various kinds of microphones to improvise a soundtrack.

Favored by many artists are *slot-loading projectors* and most (although not all) work in 16mm film (Figure 12.3). There are different models of slot loaders. Those most commonly found in the United States are Bell & Howell, Elmo and Eiki. Slot-loading projectors enable artists to quickly thread loops into projectors during a performance so that they can work with multiple loops. If you have a projector that has to have film fed into it, it is difficult to use loops and impossible to change them quickly.

Very often the sound of the projectors themselves is an essential aspect to the performed experience, as is the body of the artist interacting with the machines. Many of the performers also make use of various material processes that we have already discussed in the book, direct animation, hand-processing, hand-made microphone and more, to create the materials for their projects. Since the performed film is so idiosyncratic to the individual performing it, I have

a few examples on the website of various performances that include the artists conducting their work as well as a digital recording of the screen for Roger Beebe's *TB TX DANCE* (2006).

TB TX DANCE is a film that was originally commissioned by Mike Plante as part of his lunchfilm series (http://lunchfilm.blogspot.com/). Plante takes an artist to lunch and, based on their conversation during that lunch, commissions a film from the artist for the series with criteria based on the conversations over that lunch for the price of that lunch. There is no free lunch. To date over fifty films have been commissioned this way, but Beebe's was one of the earliest. The film was made by running clear leader through a laser printer and then making a positive and negative print (Figure 12.4). The printed area extends all the way into where an optical track would be so that the image also provides a soundtrack. According to Beebe, the idea to project the positive and negative prints side by side occurred to him while on tour. He had two projectors set up and at the end of the night in Wilmington, North Carolina, because of the unique width of the screen in a classroom he decided to run the positive and the negative print simultaneously, panning between the audio tracks. Thus his first double screen projection was born!

Beebe has made touring with his work an essential aspect of the work itself. Although he has had films in festivals and screened individual pieces without being present or as part of a program, more recently his presence, manipulation and orchestration of the work is a critical part of the art. What follows is an interview with Roger Beebe about his work, how he came to his process and the evolving community of artists and curators that he is a part of. But before I do that, I'd like to set you an assignment or two.

SHOOTING 16MM FILM IN A 35MM CAMERA

While this particular process is not necessarily about performance, its strange fluttering effect is most appreciated on repeated viewing and, because only a very small amount of film can be shot at once, it is unlikely that it will be sent to a lab (as no commercial lab would process 6–7ft of film at a time). Thus the whole act of engaging in this particular method lends itself to incorporating it into some sort of looped performance as opposed to optical printing, although that is possible too. Very simply put, this method is shooting 16mm film in a 35mm still camera. I have also had students shoot 16mm film in a 120mm camera, but that didn't seem to work out as well, as they had to rewind the film into used paper rolls, whereas with 35mm cassettes it is still possible to purchase empties, and used bulk loaders are very cheaply purchased on eBay. Also, this process and using it as a performance have the added benefit of being extremely reasonable financially. A single 100ft roll of film will get you 16–17 rolls of film, each of which can be made into a loop and projected.

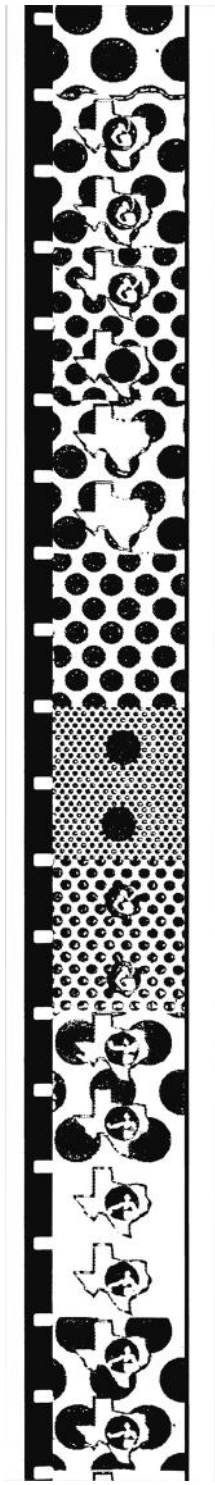

FIGURE 12.4
Scanned 16mm film strip from *TB TX DANCE*. Courtesy of Roger Beebe.

FIGURE 12.5
My Pentax K1000 with a 50mm Lens (a workhorse!).

FIGURE 12.6
One of a number of bulk loaders I have. I use it to bulk load 35mm movie film into cassettes for still photos as well as 16mm. In this picture the light-tight cover has been taken off and a daylight spool has been put onto the spindle. Once the cover is back on, the chamber is completely light tight.

What you will need

- An old-fashioned, hand-wound (not electric rewind, these don't seem to work) 35mm still camera. I use a Pentax K1000 and it works beautifully.
- A bulk loader and at least a dozen 35mm reusable cassettes (that is what they call the film canisters).
- 100ft of 16mm film on a daylight spool. I recommend color or black and white reversal for performance unless you want a negative image.
- Scissors.
- A changing bag or a completely light-tight space to load the 16mm film into the bulk loader. (If you decide to load it in the semi-dark, just pull off the first 5ft of film before you spool off any.)
- ⅜″ paper tape is useful to help adhere the film to the spindle as the 16mm comes out more easily than 35mm.

The process

1. In a dark room or changing bag, put the daylight spool directly onto the spindle in the bulk loader, thread the film through the slot going from the main chamber to where the cassette goes and close up the bulk loader. It's a good idea to try this a few times in the light with some leader or a shot roll of film so you can get the hang of it. You want the film to come off emulsion in so you can wind up the film on the spindles emulsion in.
2. Take the bulk loader out into the light. Open up (if you didn't leave it open after you were loading it) the cassette side of the bulk loader. You

should see a few inches of 16mm poking out. Get a spindle and a cassette, and tape or thread the film through the spindle. Slide the cassette over the spindle and put the caps on securely. Be sure that the big part of the spindle (which will go into the winding mechanism on the camera) is up and that the cassette is in properly.

3. Close the cassette into its winding bay and wind the film until you get resistance. Some bulk loaders have a film counter that will work properly even with 16mm being wound. If this is the case, you want 36 exp. You don't want to wind too tight or you'll have trouble getting the film to take up in the camera and end up losing a foot or so as you try to load it.
4. Load the 35mm camera as you normally would, except you may have to use a small amount of tape to adhere the 16mm film to the take-up winder; don't overdo it. You don't want to end up with crud in your camera.
5. Close up your camera, set it for the ASA of the film you put in and you can use the internal light meter of the 35mm to shoot. I recommend shooting patterns and/or the same thing over and over again so that an entire roll has a similar feel. Some students have alternated textures and that also produces interesting results.
6. Once you have shot all your rolls you can take them into the darkroom or your home lab and, in a changing bag or entirely light-tight space, down-spool them into developing tanks. I like to put just a few rolls in

FIGURE 12.8
A still film "cassette" with 16mm film loaded in it.

FIGURE 12.7
(*Right*) 16mm black and white reversal film titles shot in 35mm still cameras and hand-developed as negative.

per .5L can so that they don't stick together. It is also possible, especially if you have rewinds in your darkroom, to bring a tape splicer in and tape splice your rolls together and then load them into a Lomo tank.

7. However you decide to process them, hang them to dry after (for about an hour until they are completely dry) and then you can make your loops and project them!

Between this chapter and the first two in this book, you should probably have some facility with making very interesting direct animations. For some reason this really seems to lend itself to performance. Devon Damonte *only* produces animation for performance these days and he works with a group of creatives putting on shows together, sometimes projecting all the work simultaneously. So, because it is quite a lot to work up to an individual performance, for the practicum below your assignment is to find a handful of people to work with and a space, and put on a performance!

FILM AS PERFORMANCE—A PRACTICUM

1. Find a space with electricity that can be made relatively dark and can fit as many people as you'd like to attend your performance.
2. Get a few projectors and tables that you can set them on, and a wall or screen to project onto.
3. Get a couple of speakers to connect to the projectors so that you can hear the sound if there is sound film.
4. Get some found footage or make some materials that you would like to put together and make them into loops of different sizes.
5. Begin to play with the size of the various projected images, pan the sound between the various projectors, overlap your images, and put them one inside the other.
6. Take out your loops and modify them. Make them shorter or longer, or draw or paint on them.
7. Keep doing this until you've got something you think is interesting.
8. Invite some friends to watch and then set them the same challenge.
9. Once you have three or four film performances, have a "show" with your friends and neighbors.
10. See if you can get some musicians or poets or singers to participate as well and make live sound for the event.
11. Publicize it and make it a monthly or bi-monthly occurrence.

The two featured artists in this chapter are Roger Beebe and Peter Miller. Although they both exhibit their work primarily as performance, Beebe presents more in a theatrical setting and Miller tends towards gallery-based work. What is similar is that they both almost always exhibit their work with an audience

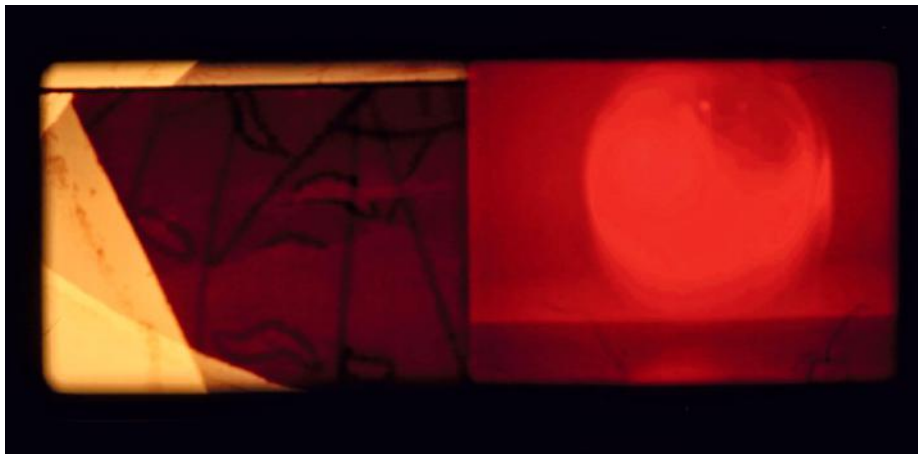

FIGURE 12.9
Emerson student Ariel Teal created a three 16mm projector performance with two loops. On the left is a loop created by adhering cut-out stickers of butterfly wings to clear celluloid and then optically reprinting it to form a loop. The right is a found print with sound that is also a loop. The loops are of different lengths so that they cycle together in a variety of ways over the 2-minute performance.

FIGURE 12.10
Emerson student David Fonseca created a three-projector performance incorporating loops on the left and right made from 16mm film shot in a 35mm still camera and a continuous strand of hand-processed film in the center. Both Teal and Fonseca made these in my class "Alternative Production Techniques".

and that audience perception of the experience is primary to the piece's meaning. The next filmmaker I interviewed combines both performance and installation in his work and produces in a variety of formats. His name is Peter Miller and I first came across him and his work at a dinner party with friends. I was meeting people I didn't know and the usual questions came up about what I do. Sometimes, if I say I'm a professor, people will just shrug and turn the conversation elsewhere or ask where I teach and then comment on that somehow. In this instance the couple involved asked what I teach. I said, "Film" and they said, "What kind?" and I went ahead and said, "Experimental non-fiction" and they said, "Oh, do you know our friend Peter Miller?" As I'm sure you are able to

assess by now, that is not the usual response to this series of questions, particularly as they were friends of an epidemiologist friend of mine. I said, "No", and they said, "Well you must know who he is studying with, this Austrian filmmaker Peter Tscherkassky." I responded that I did in fact know the work of Tscherkassky and we proceeded to have a discussion about the other Austrian experimental filmmakers they had heard of and how certain artist grants that were very prestigious in Europe were virtually unknown in the United States.

It was a charming change of pace from the usual dinner party discussions and then I put it out of my mind until Miller was an applicant for a position at the college where I teach. At this point I was able to see his work in some depth and, although his mixture of installation and performance was not the right fit for our position, I was so impressed with his work that I followed up with him for this book.

BIOGRAPHY OF PETER MILLER

Peter Miller is an artist living and making work in Europe. He took his MFA from the School of the Art Institute of Chicago, is originally from Vermont and apprenticed to be a silversmith. His film and photographic works are preoccupied with magic, and generally investigate the phenomena of the cinema and its constituent, irreducible elements: lens, light, flicker, audience, projection, etc. His films are distributed by Light Cone in Paris. He is represented by Galerie Crone in Berlin. What follows is an interview with Peter about his process.

INTERVIEW WITH PETER MILLER

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a new media practitioner, a shaman, a performer? How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

Peter Miller: I am an artist. Those four words form a complicated statement and are rightfully difficult to say. Adding modifiers just makes it more complicated. That said, the artworks that I make most often take the form of 16mm and 35mm films. The word "filmmaker" is cool, because if you say you're a filmmaker—and there aren't any real prerequisites to say that—people think, *oh cool, I like films.* And, well, I like films too, all kinds of films. But to avoid the follow-up question of why I don't try to move to Hollywood I usually just say that I'm an artist. Granted, there aren't any real prerequisites to say that either, but it requires a stronger courage of conviction and lets people know more accurately who I am and what I do.

When explaining the possible difference between a *filmmaker* and an *artist making films*, I have often employed the following metaphor: there are two kinds of painters in the world, both of them work with brushes and various paints. One

of them tries to cover the largest amount of surface (usually a house exterior or interior) as quickly and with as little paint as possible. The other one sits in a studio (or *en plein air*) and stares at a blank canvas and dares to raise a brush and touch and fill that famous void. Hollywood is like the house painter; they try to deliver the best bang for your buck and they are only in it for the possible profit. The artist who works with film is more like the studio painter. They are involved in something more complex; maybe personal, maybe universal, but they are approaching the goal of painting with a different palette.

The artist is an archetype, a card in the Tarot deck of anthropology. I do not wish to reduce who people are to what they do, but there is a relationship between what we do and how we think and live and act. The artist evokes demonstrability and permissibility. Artists are a necessary component of society because of what they can demonstrate through their thinking and making, and how that in turn can open up permissions for society as a whole.

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

PM: Coming back to the ideas of "demonstrability" and "permissibility," the possible origins of works of art are everywhere. What artists do through their practice is develop the courage to listen carefully for the whispers and follow through in bringing them into the world. Every artist has at least two anecdotes about their art origins: one anecdote about when they first felt the potential impact works of art can have on the social world and another anecdote about how they first decided to begin contributing actively to that world.

For me, the first time that I realized the transformational potential a work of art can have happened to me while playing piano with my father. I must have been eight years old and I wanted to learn how to touch music the way that he could, with closed eyes, floating his fingers on an invisible water, drawing forth from that field all around us. While we were taking a short break, side by side, looking at the eighty-eight keys the piano offered up, he told me about John Cage's *4'33"*. The questions that I then had and the patient answers that my father gave me transformed my understanding of music, sound and art. I looked at the piano and saw an invisible, eighty-ninth key. I felt that permissibility that Cage had wrought and I felt respect for his courage to demonstrate it to us.

Around that same age I was a practicing magician. I read every book about magic that I could get my hands on. I practiced the illusions patiently before a mirror and I performed them for my friends. As I grew older and performed more frequently for adults I found that they didn't allow themselves to enjoy the illusions as much as my peers could. After showing an illusion to an adult I was consistently asked how I did it and if I would do it again, two things that a magician is never allowed to do. I realized that adults saw my illusions

as deceptions. Disheartened, I pursued other interests. I learned lock picking and I apprenticed to be a silversmith. My point of entry into the art world came by way of learning how to make 16mm films. Right from the beginning I felt real magic in the films that I was seeing and making. Magicians built the cinema. The history of the cinema begins with traveling magicians leasing the Lumière Brothers' invention and incorporating projected moving pictures into their act. In the cinema I found all of my early interests coalescing. The film artist is confronted with a black box they cannot see into. By adding specific lights they unlock silver particles along lengths of time. I was finally able to work with magic again. Ever since then I've practiced making works of film art that instill wonder through everyday illusions that reveal their own natural magic.

An artist, like a magician, has a practice. They are never finished, they are always practicing, trying new things, questioning their own assumptions, inventing new methods and bettering their field for themselves, their colleagues and the people whom they hope to touch with their work.

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

PM: One of the greatest things about being able to say "I am an artist" in the post-studio, post-medium age is that you get to be any kind of artist you want to be. Any artist can work in any media nowadays; many work in most. To come back to permissibility again, there's actually an imperative to make whatever it is that you feel drawn to, by whatever means or methods necessary and in whatever media it takes to bring into being the work of art that has picked you as its point of entry into the world. Because I work with 16mm film a lot, I am frequently asked the question, "Why do you work in film when you know that video exists?" Though I do make videos as well, I still feel most comfortable thinking in film. Film is to me like a mechanical language that is fairly easy to learn fluently, while video today is a digital language that nobody seems to understand completely. Many of the 16mm films that I make have the aforementioned affiliation with magic because I don't feel much magic in video technology.

I insist that I am not being nostalgic when I choose to make a work of art with film. In my read of art history it was the development of photography and its superior abilities of representation that allowed painting to eschew the creation of landscapes and portraits, and finally be able to become what it always was: paint. If you ask me, painting only became more interesting after photography relieved it of the obligation of making portraits and landscapes. When the cinema first appeared it copied the theatre, films were made from one perspective and the audience viewed actors acting on a stage. Theatre was confronted by a new technology that could reproduce the actor's performance identically every night and could be shown in multiple theatres at the same time. Instead of disappearing, the theatre became itself because it came back to its irreducible

elements and was no longer burdened by the need to reproduce reality. Motion picture film is in the same position now, finally being relieved of the burden to reproduce reality because that's what video is doing. I'm happy to be working with film at the time when it gets to discover its irreducible elements. Those elements are the subjects of my films. I think it odd that neither painting nor the theatre is accused of nostalgia. Since painting had to be about painting in order to become what it is today and theatre had to be about theatre, I'm not surprised that the most interesting thing for me about film right now is film itself and the filmic cinema.

Apropos the question of what works of art are about, I have an anecdote that helped me imagine another possible world that artworks can inhabit. When I lived in Boston I worked at Cinelab, a motion picture laboratory. A film student of Rob Todd's (an incredibly prolific film artist) came in and told me about the following conversation:

> *Film Student*: Hey Rob, did I tell you that I'm working on a new 16mm film?
> *Rob Todd*: "Sounds cool. What's it like?"
> *Film Student*: "Do you mean, what is it *about*?"
> *Rob Todd*: "Oh . . . it's an 'about' film."

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

PM: There's this five-sided object that artists struggle within. The five corners are:

1. The material to make the work.
2. The space to make the work.
3. The time to make the work.
4. The desire to make the work.
5. The place to show the work.

When artists meet up with other artists these are the five things that they talk about a lot. Of the five, #5, showing work, is the trickiest corner because it's the furthest corner from the actual inception of the work. I have several 16mm and 35mm finished films that I've never gotten around to showing anyone. It wasn't my goal when making them, but I think it's a healthy, natural product of a sustained practice. Of course there's the film festival thing. A painter can't submit a new painting to a painting festival. Film artists have a singular channel for sharing their artworks. That said, there is also a danger that the film artist can grow to think that they actually are a Hollywood filmmaker just because they're wearing a badge, standing on a red carpet and showing works at the same festival as Hollywood premieres, whereas the actual difference in terms of critical response, let alone goals (see house painter vs. studio painter above),

is huge. If they are not careful, that can develop quickly into an art practice where #1–4 merely become the means for #5 instead of #5 being the possible outcome of a well-wrought #1–4. If an artist enters this five-sided object only because they are interested in #5, they shouldn't be in the object in the first place.

I worked for several years as a projectionist and there's a lot to be said for the cinema as a venue for experiencing works of film art. I can't think of another medium that has that kind of worldwide standardization and, for an artist, it's nice to know that certain factors such as room darkness, screen luminance and viewer positioning will be reliable. A painter doesn't know what kind of light will fall on their painting or how large the wall will be upon which it hangs. Musicians deal with vastly different acoustics at each venue.

The performances and installations that I make in film do not usually take place in the cinema because the cinema does such a great job of hiding how it works. In *projectionism* (the anthropology of the projection booth) there is this reference to the Wizard of Oz and his great quote, "Pay no attention to the man behind the curtain", because that would reveal the illusion. When we watch a film we are largely oblivious to its point of origin: the machine in the soundproof booth behind us. Sometimes after a film was finished, I'd carry the reels out of the booth and the audience would see me holding the very objects that were the film that they just saw. They would look at me slack-jawed, unable to imagine that theses things in my hands were now the things in their heads. When working with film in installation or performance, I am able to mobilize that strangeness in a way that can return a viewer to him or herself refreshed. I draw back the curtain thusly.

KR: And finally, your chapter is about film as performance. Please elaborate how you came to such an activity. Are you part of a community of makers (either locally or internationally) who communicate with each other about their work and get together either virtually or physically to discuss/show/celebrate? Where? When? How? What happens?

PM: I am lucky to have a few close friends who either work in a manner similar to mine or know me well enough to be able to help me understand where I might be trying to take a particular piece before it is even entirely clear to me. Such colleagues are rare, precious and beautiful. I try to spend as much time as I can with them because through our discussions I feel I am most myself.

According to the census, there were 288,000 people working as painters or sculptors in the United States in 2001. There wasn't a box that you could tick off for "artist working in film", because there aren't very many of us. If I had to venture to guess, I'd say that worldwide there are less than a few thousand. I affectionately call this group the EFC (experimental film community). Painters form their own communities under the larger umbrella of painting, but our group is so small that we're sort of all in it together and that brings with it inflated dramas, complex affairs and icky power struggles. Lately I've felt that

the EFC is more of a headache and heartache than it is worth, but I hope to change my mind about that.

The American singer/songwriter (and inventor of digital fine-art photography) Graham Nash opens the song "Teach the Children Well" with some sage advice, "You, who are on this road, must have a code that you can live by." Your code should be reviewed frequently, but it should never be abandoned. Being an artist is not supposed to be easy and you will need a light when you think you've lost your way. When I teach art making to young artists I always make sure to tell them that as well as a few other things. Be wary of doing other people's work for free; your time and resources are precious and can easily fall out of balance, and they are likely going to get paid well for it. Try to find your own irreducible elements; they will be the force that drives your practice because they will be the works that only you can make. Most importantly: both your practice itself and the means you find to sustain it ought to be ethical. You will have to live with the repercussions of your work and the way that you chose to bring them into the world. After all, the following line in that Crosby, Stills and Nash song is: "*And so become yourself. . . .*"

*

Peter's interest in projection as activity and performance became a central piece of a series of works called *Fulcrum*. The works are called *Fulcrum Film I: Flat*, *Fulcrum Film II: Length* and *Fulcrum Film III: Weight*. Peter describes these works:

FIGURE 12.11
Fulcrum Film III: Weight by Peter Miller, photographed by Artur Holling. Image courtesy of the artist.

FIGURE 12.12
Fulcrum Film III: Weight by Peter Miller, photographed by Artur Holling. Image courtesy of the artist.

"Fulcrum films describe films that transform film material from a photographic image into a three-dimensional sculpture in order to showcase the projector as the place where films pivot from being unseen to being shown" (www.peter miller.info/fulcrum3.html). Each investigates a particular kind of transformation of the film. In *Fulcrum Film III: Weight*, film runs through a projector but, instead of being taken up on a reel, the film is tied to a large red balloon by Miller, who then releases it to the sky. As the 100ft of 16mm work their way through the projector, the balloon rises higher and higher, and eventually the film runs out. The film that has run through the projector is a slowed reprint of the Charles and Ray Eames film *Powers of Ten* in which the image zooms out from a blanket in Grant Park, Chicago, until the frame encompasses the entire earth.

ROGER BEEBE BIOGRAPHY

Roger Beebe is an Associate Professor in the Department of Art at the Ohio State University. He has screened his films around the globe with recent solo shows at the Laboratorio Arte Alameda (Mexico City), the School of the Art Institute of Chicago, Anthology Film Archives, and dozens of other venues. He has won numerous honors and awards including a 2013 MacDowell Colony residency, a 2009 Visiting Foreign Artists Grant from the Canada Council for the Arts, a 2006 Individual Artist Grant from the State of Florida, and Best

Experimental Film at the 2006 Chicago Underground Film Festival. Beebe is also a film programmer: he ran Flicker, a festival of small-gauge film in Chapel Hill, North Carolina, from 1997–2000 and was the founder and Artistic Director of FLEX, the Florida Experimental Film Festival, from 2004–2014.

As Roger is currently migrating his website from the University of Florida website, the best way to see his work and contact him is through his vimeo account. See: http://vimeo.com/user1243144.

INTERVIEW WITH ROGER BEEBE

Kathryn Ramey: How do you describe what you do and what kind of work you make?

Roger Beebe: My new job (at Ohio State) was listed as a "moving-image artist", but that language feels really alien in my mouth (at least at this point, just one

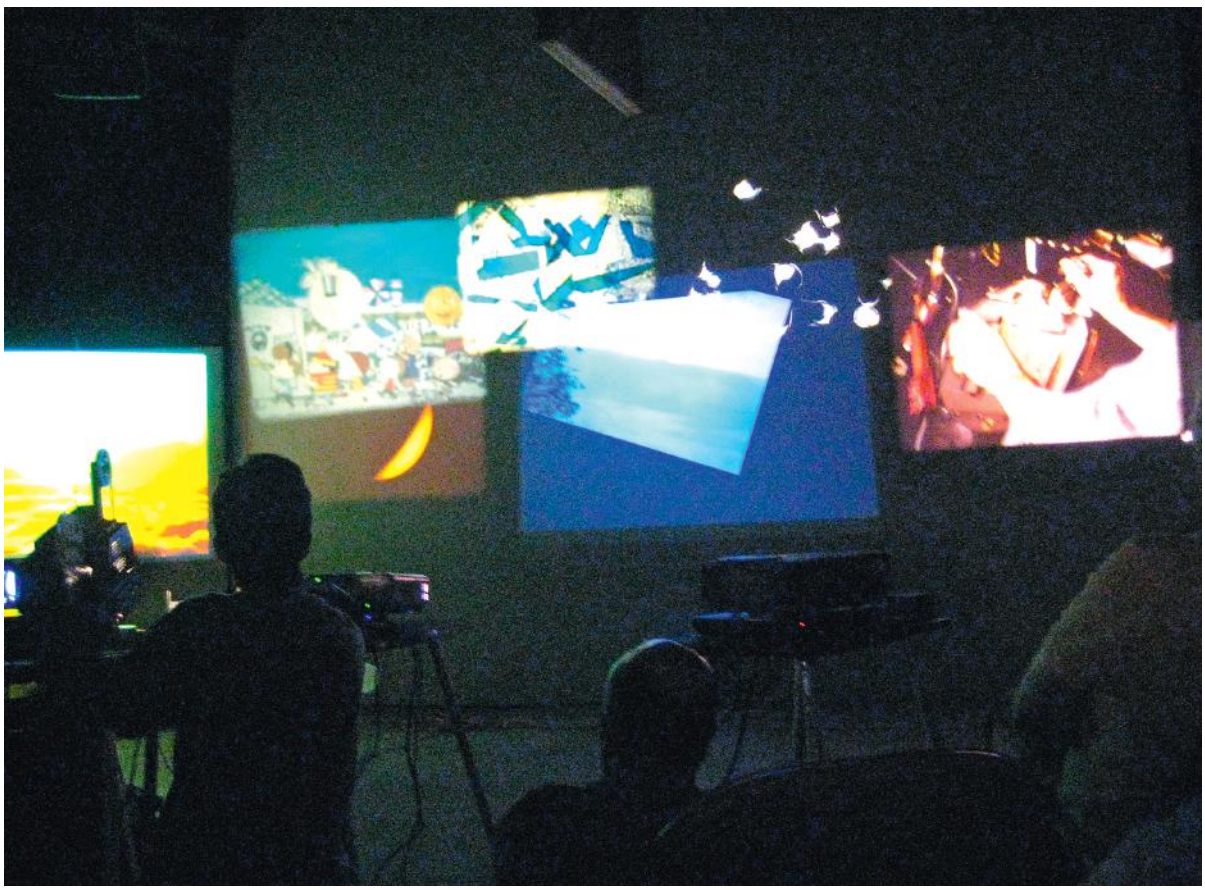

FIGURE 12.13
Documentation of a Roger Beebe performance. Courtesy of the artist.

semester into the new gig). I've always just called myself a filmmaker (or experimental filmmaker, if I want to avoid misunderstanding, since if you say filmmaker to a stranger, s/he'll think you want to be Steven Spielberg or something). There's a performative element to the multiple-projector works (about which more later), but I still think of those just as films that just happen to be projected on more than one projector. In my head, I'm differentiating them from a more open, free-form, exploratory version of "expanded cinema", which doesn't feel at all like what I'm trying to do here, with the very strict "scores" that govern the way the different frames interact.

When I have to clarify what "experimental" is for someone outside of the community of makers, I usually start with non-narrative (at least in my version of it), abstract, no acting, no scripts, etc. Of course, none of those things is absolute, but they point in the direction of the work I make. I also tend to emphasize a documentary impulse that's shared by most of the work, meaning that it's not just formal or structural (although it is also that) but it also seeks to engage with the world, with history, politics and so on.

KR: Could you elaborate on the difference between your work and what you term "expanded cinema"? What artists, either historic or contemporary, are you thinking of?

RB: I made a somewhat intentionally vague gesture toward expanded cinema partially because I think it's an umbrella that accommodates a lot of diverse work growing out of very different traditions and using very different strategies. Most of the scholarship on expanded cinema starts by pointing to the definitional trouble. I do think the roots of the term in the 1960s with a figure like Stan VanDerBeek are part of what I'm trying to distance myself from (even though I'm interested in that work). And maybe, because of that founding in the 1960s, I fear people who hear the term might expect a more open, exploratory event than what my screenings offer. (For those interested in really digging into the world of expanded cinema, I'd recommend Jonathan Walley's current scholarship on the subject; I can only hem and haw as an artist here, but he's done the deep digging to really talk about that tradition. Here's also a hilariously impossible pdf that attempts to trace expanded cinema's various manifestations since the dawn of cinema: http://closeup.beepweb.co.uk/files/7113/1983/1835/expanded-cinema-map.pdf.)

KR: This non-narrative description is often a sticking point as (of course) it is possible to find narrative in almost everything (Michael Snow's* Wavelength *is a murder mystery) but you seem to be elaborating a particular kind of difference between theatrical conventions of narrative and other kinds of storytelling. Can you expand on that?

RB: I am interested in the question of narrative, but since that's the default mode for cinema (with documentary a distant second), I feel like I need to indicate my difference from that model up front. I'm interested in where narrative re-emerges in experimental film, but I'm mostly interested in when that happens

after the radical ground-clearing of truly experimental gestures. Things that tend to get called "experimental narratives" (like Christopher Nolan's *Memento*) seem pretty traditional or conservative to me, and whatever experimentation there is really happens at the fringes of the central narrative (with sync sound and all else that comes with that mode of production).

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

RB: I don't have an MFA or anything and have very little training in filmmaking of any sort—I took one formal class, not focused on experimental film, where I learned to load a Bolex and did a second 16mm film as an independent study—so my path to my current practice was pretty circuitous. I was at Duke to do a PhD in the Program in Literature (a critical theory program), and I started making films on the side. I had seen VERY few experimental films, so my first films were influenced by other things (Godard, postmodern metafiction, some of the more adventurous 80s and 90s indie rockers). As I was making films, I also started seeing more work, and the films of Alan Berliner, Jem Cohen, Craig Baldwin, Bill Brown, Naomi Uman and others started to trickle in as influences. It wasn't until 2000 when I left Duke that I really made what I'd consider my first "real" experimental film (*The Strip Mall Trilogy*, shot in 2000, finished in early 2001). I worked (and still work) in a markedly different mode in video, and I'm less sure where that comes from. But a lot of the work since 2000 has been thematically related to *The Strip Mall Trilogy*, both in content and form.

In 2006, I also started (somewhat accidentally) making multi-projector works. I took my films on the road for a three-month, 7000-mile, forty-show tour, and one of the films I had with me, *TB TX DANCE*, I had in both a positive and negative version. Since I had two 16mm projectors with me for the tour (to avoid having breaks for reel changes), I thought I'd test out a side-by-side projection of the two prints. It ended up working better than I'd anticipated—a kind of poor-man's cinemascope—so it planted the seed that would come to fruition in the films that followed.

TB TX DANCE was also a turning point in my interest in the use of cameraless techniques in my work. I'd done a little as early as the end of the 90s (doing direct animation on *What Boys Want*, hand-tinting black-and-white 16mm footage with extra-fine-point Sharpie markers), but in this last period almost every one of my films includes some cameraless techniques, whether it's hand-processing, ray-o-grams, bleaching, etching with a laser cutter, printing directly on the film in a laser printer, etc.

The ideas are partially formal (like wanting to do single frames only in the first part of *The Strip Mall Trilogy* or wanting to do in-camera dissolves only for the third part) or technological (making soundtracks with laser toner by printing

directly onto clear leader), but they're also often inspired by my political and theoretical commitments. It can be something very simple, like suddenly realizing that Shaquille O'Neal's last name is Irish and then doing research to flesh out the complex history of race (*Famous Irish Americans* (2003)). Often it's something I encounter in the landscape, like the gas station in *S A V E* (2006) or the various AAA signs in *AAAAA Motion Picture* (2010). A film never really takes off for me until these various things (formal, technological, conceptual) all click into place and start working in concert.

KR: What is the relationship between your graduate work and your film work? Did you finish your PhD? What is your dissertation on?

RB: I did finish my PhD. The dissertation was on . . . nothing much I want to talk about now. It was a broad-ranging work of media scholarship, focused mostly on popular media like *Babe* (the talking pig movie), *Terminator 2*, Kurt Cobain, Tupac Shakur, Spike Jonze and other stuff. It was a bit of a mess as a whole, but I think there were some strong sections (a few of which exist in print in a few academic collections).

But while I don't want to talk much about the dissertation, I do think that work still subtends my films, at least as the general backdrop against which my ideas emerge. I wouldn't be making the films I did if I hadn't read and studied with Fredric Jameson. Some of the films are inspired by gender studies or critical race theory. Others take something from poststructuralist linguistics. The theory is never at the center of the film (or at least not at the front and center), but it does provide some foundation for the ideas that I develop in the films.

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

RB: Oh, crap, did I just answer that? Maybe this is where I explain the difference between the celluloid-based work and the video work. I've occasionally used video as an acquisition medium (e.g. *Congratulations (One Step at a Time)* (2014)), but, much more often, the video work tends to be found footage. There's a fair amount of found footage (and sound) in the film work as well, but the kinds of things one "finds" in each medium push me in very different directions. In general, the videos are much more engaged with popular culture and are much more playful. The image tends to be flatter as well, partially out of my sense that I don't want to (or don't know how to) make video try to simulate the beauty of film.

In the film work, most of which is in 16mm—although there's one 35mm film (*NO!* (2014)) and a few Super-8mm films as well (*The Strip Mall Trilogy* and *Composition in Red & Yellow* (2002))—I like to use the resistance of the medium to help surprise myself. Many of the films are in-camera edits, which means I'm essentially shooting "blind" in the sense that I don't really know what I've done until I get it back from the lab weeks later. I also have done a lot of

"wrong" things while shooting, and the Bolex really offers some pretty amazing ways to do things wrong (like rotating the lens turret while shooting or back-winding and doing multiple passes on the same strip of film or doing in-camera fades with the variable shutter or tromboning a zoom lens like a teenager on acid, etc., etc., etc.). Video feels both very controlled and very malleable to me in a way that film doesn't, and so I think I try to amplify that in the way I use each medium.

And, Jesus, I hope these films are about something. It varies pretty widely from film to film—I have a hard time saying something global like "my films deal with . . ."—but they're definitely not just a bunch of pretty colors or whatever. If you watch *A Woman, A Mirror* and don't get that it's about gender and technology (and the "technologies of gender"), then I worry that the film hasn't really succeeded (or you haven't!).

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

RB: Part of why I self-define as an experimental filmmaker and not a moving-image artist is that I exhibit my work primarily in film festivals rather than in museums and galleries. I prefer that context for a number of reasons. First and foremost is that I really like the darkened room and the expectation that a spectator will arrive before the film starts and stay for the duration. It's a really special kind of attention that the film gets that way, and I hope I reward that time and attention with a meaningful experience. In the era of overload, where watching video on your laptop means having a tiny window open with lots of other distracting windows and other devices, and with beeps and alerts popping up every few seconds, I really do think that turning off the cellphone and heading into the darkened theater is a really important experience of time.

I've been screening less in festivals lately though, largely because the multiple-projector works are so hard to pull off technologically, and instead I've been showing mostly as part of the kind of roadshows that I mentioned above. I first toured with films in the late 90s when I was running Flicker, a small-gauge film festival based in Chapel Hill, North Carolina, but that program was a curated one that included only one of my films. In the early 2000s I did a few tours with other filmmakers (Tony Gault, Bill Brown) and musicians (Kent Lambert/Roommate, Nuclear Family, Erin Tobey), but since 2007 I've been hitting the road alone, finding ways of getting a semester off every few years in order to head out for three months at a time. I bring all my own equipment with me (seven projectors, a PA, stands, cables, etc.), so I can turn any space with a screen or a big white wall into a venue for this work. I've done shows in proper movie theaters, microcinemas, museums, galleries, classrooms, outdoor parks, a few planetariums, a Freemason's lodge and more. It's really rewarding to be in the room with an audience (and hopefully for them to be in a room with each other and with me). Part of the reason I developed these performative works is that I felt a little bored on tour when I just projected

my single-channel films, so the projector performance really gives me something to do. It also makes the event seem unique every night, and I think it's really shut down the question that I used to get asked about why not just distribute the films online and have people watch them on YouTube or Vimeo. Something special happens in that darkened room that you can't reproduce otherwise (or at least I hope it does).

I'd say about audience that part of why I like these roadshows too is that it's often not an experimental film audience who sees the work. The novelty of the multiple-projector format is something that draws people in who might not otherwise come, but also taking the shows to spaces where this kind of work isn't often seen can reach some people "where they live" as it were. I do think the films tend to get a warm reception from people who don't have any history with experimental film, so the trick is always just getting them in the room (or getting in the room where they already are).

KR: And finally, your chapter is about "Film as Performance". Please elaborate how you came to such an activity? Are you part of a community of makers (either locally or internationally) who communicate with each other about their work and get together either virtually or physically to discuss/show/celebrate? Where? When? How? What happens?

RB: I used to really resist the idea that I was part of the show. When the audience would turn around to look at what I was doing, I'd feel like they were missing what was going on up on the screen. But I've come to terms with the fact that my physical engagement with the projectors is part of what people experience when I do these shows. I've always liked to have the projectors in the room and have people see them ahead of time and hear them during projection. Having them see me do the projection is really just part of the same gesture of laying the labor bare before them so they know (unlike when they go to a multiplex) how their sausage gets made. I hope it's also empowering for them to realize that there's just a regular guy running between these cranky old machines and that there's not some mystical process that happens somewhere else, the results of which appear before them like magic.

As for a community of folks who're fellow travelers, there are, first, literal travelers, like Vanessa Renwick and Bill Daniel (who did an enormous tour together in 2002 that provided direct inspiration for my later tours) as well as Matt McCormick, Bill Brown, Thomas Comerford, Ben Russell, Alain LeTourneau and Pam Minty, and others in my generation in addition to younger makers who're now continuing this practice, including Alee Peoples, Charlotte Taylor, Kelly Gallagher and Lauren Cook. There has often been direct sharing of resources and networks among all of these travelers, so that we're not constantly reinventing the wheel, and that's been a helpful extended community to be a part of.

There are also others making work for multiple projectors—Bruce McClure, Sandra Gibson and Luis Recoder, to name just a few of the more notable

FIGURE 12.14
Roger Beebe setting up for a performance. Photo courtesy of the artist.

examples in the United States—but I'd be reluctant to call that a community in the same way. I'm interested in the work they're making, but it seems very different than the kind of work I'm doing. I have seen some pieces that feel a little closer to my practice—I just saw a wonderful performance by Mike A. Morris a few weeks ago for example—but there's not (yet?) a tight-knit group focused on this part of contemporary practice. FLEXfest 2014, my final festival as artistic director, did welcome some makers who work in this mode—the Trinchera Ensemble from Mexico City, Sally Golding from London—so that was a small gesture at trying to "tighten that knit".

KR: I have argued elsewhere (Ramey 2002) that the "experimental film community" is really just an expanded network of interrelated persons, groups and activities that coalesce around certain geographical and/or (for lack of a better phrase) practice-oriented interests. People come together because of shared interests and circumstances, and smaller, more tightly knit groups (what you describe as "fellow travelers") form within this diffused web. What you describe above elaborates this idea. Occasionally a single artist/group will "surface" into the larger (more people know about and there is greater access to economic and cultural resources) art or festival world. When this happens does it impact their "membership" and/or commitment to the smaller "group"? In other words, what is the impact of "fame" or art/festival world "success" on the network, the individuals that compose it and the individual who achieves success outside the margins?

RB: I don't think festival success generally pulls people out of the same orbit as everyone else. I mean, winning the top prize at Ann Arbor doesn't suddenly mean you can quit your job and live off of your filmmaking! Even getting a Guggenheim (and there are a fair number of my peers who've done that now) just mostly means you get to take a year off from teaching. For those who cross into the art world, I guess they do disappear from these smaller groups, but I haven't seen many successfully make that transition. (Inclusion in the Whitney Biennial doesn't really seem to move makers from one world into the other either.) One or two filmmakers have also escaped into Indywood (and I'm thinking specifically about Miranda July, who I used to rub elbows with at festivals in Portland and Austin back in the day), and I guess they do disappear as well. But really I think the low-stakes game that is experimental film means there's not a giant gap between those who're having major success and those who're struggling to place their work. I have good friends in the community at both ends of the spectrum (some of whom have moved up that short ladder, others of whom have been holding steady for the duration of our friendship). I'm wondering where I am on that continuum and whether that has a role in me being able to stay in touch with a range of makers.

There is, though, the question of geography, which is how you started your question. I do know that when I moved from Durham to Gainesville my practice changed pretty dramatically, partially because of severing the most immediate ties to the community of makers of which I was a part while in grad school. I'm not sure if my new move will have quite the same dramatic impact (partially because the community here is mostly student-based, so it's a community of my own making; partially because I'm more sure of my direction as a filmmaker), but I expect there will be new influences and collaborations and connections that inflect my work.

I do think that experimental film is interesting in the fact that many interesting makers have spent the bulk of their professional careers outside of New York and San Francisco (in places like Iowa City or Boulder of Buffalo or . . . hell, Gainesville and Durham). And I think those local scenes can be interestingly idiosyncratic in a way that might be harder in those traditional "centers" of art and film. It's a product of the place of experimental film in the academy, obviously, and maybe it's one of the life bloods of experimental film (in the same way that regional music scenes can burst onto the national stage and reveal a whole new sound). In any case, that's very different from the art world, where nothing counts until it happens in New York. (Yes, I know that's a reduction, but it does at least "square the circle" of this interview by explaining once again why I call myself an experimental filmmaker rather than a moving-image artist!)

Roger Beebe's assignment

1. Find a machine that can print/make images and/or sounds.
2. Make the machine (whatever machine) do something that it wasn't intended to do. Don't worry if you break it.*
3. Repeat.

*Works best if it's someone else's machine!**

**I'm not sure I really mean that, but I know that *TB TX DANCE* was made under cover of night on our office printer, and I was pretty sure running film through it was going to kill it. (It didn't. Prints just after my sessions seemed a little dusty, but that was all.) I do like doing everything wrong—changing the aperture while shooting, twisting the turret around with the Bolex running, etc.

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CHAPTER 13

Glitch

Video/digital breaks down

all art + time = glitch art

Evan Meaney, Facebook post, May 8, 2014

A few years ago I wandered into a presentation by a guy named Evan Meaney at the University Film and Video Association annual conference. He was funny and sounded smart, and was talking about this new-fangled thing called hex editing and glitch art. He had been a student of a friend of mine at the University of Iowa in the Department of Cinema and Comparative Literature, but he wasn't talking about *movies*, he was talking about destroying code and entropy and how everything is constantly already devolving. Needless to say I was immediately interested. He also happens to be a very friendly chap so even though I am about twice his age (or feel that way) he has been very kind to me, presenting his new work to my Alternative Production classes via Skype for the last several years and fielding the queries by myself and my students when the need arises. It is important to acknowledge that this chapter wouldn't even be in this book if we hadn't met that day. Despite the fact that I'm interested in all kinds of art, I just hadn't crossed paths with anyone who made code-based art so interesting or accessible to a silver process gal like me.

So what is a glitch? A glitch is an error. A break in the code, a bending of the signal, a decay in the sound/image such that a *rupture* to normative viewing/listening expectations occurs. The first published evidence of the use of the term "glitch" in English was in 1962 by astronaut John Glenn using the term to describe a surge in voltage that blew a circuit (2014, *Oxford English Dictionary*). It has been speculated that the word comes from the Yiddish term "glitsch", which means to slide (Moradi *et al*. 2009). However it came to the vernacular, it began being used by engineers in the 1960s as a slang term for imperfections in a system and was adopted at some point later on to describe sound and visual art that embraced or even intentionally created imperfections in digital sound and art production and performance. Glitches can be "naturally" occurring, in that they happen because of some interference in the normative flow/processing of information. Figure 13.1 is a glitch that happened when I was trying to scan old family slides and one got stuck in the tray.

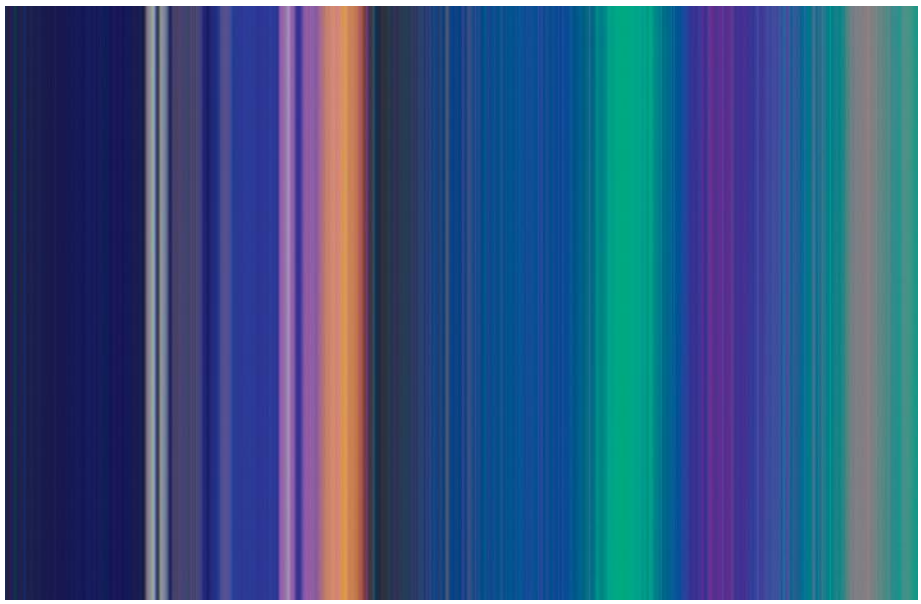

FIGURE 13.1
Slide scanning glitch.

In terms of the history of art and media, glitch art is a relatively recent phenomenon, beginning just before the millennium and emerging in many cases from earlier experiments with circuit bending. It began with artists experimenting with flaws in software or hardware, such as the collective jodi.org (artists Joan Heemskerk and Dirk Paesmans) with backgrounds in photography and video art, who began in the mid-1990s to create artworks for the web, including one that crashed your system (Platou 2009). Other artists such as Johnny Rogers and noteNdo (Jeff Donaldson) began to experiment with "bending" Nintendo and Sega video games. Donaldson points to observing naturally occurring glitches (as in game crashing) while playing video games in the 1980s as a seminal moment, although he did not begin to bend games intentionally until 2000 (Cates 2012). To "bend" means to create an error, or glitch, in a system, software, hardware, game, audio or digital file, such that it can still function, but with visible and/or audible evidence of the error. The objective is to "bend" but not "break". Truly broken code, hardware or games will not play at all.

Early glitch scholar Iman Moradi differentiates between glitches that are the unintended result of a flaw in the system, software or hardware, forced glitches that are the result of intervention in the system, software or hardware to create an unpredictable result and "glitch-alikes" in which "adept designers" mimic the visual style of "pure glitches" found in their "original habitats" without actually attempting to create an actual glitch or bend in the system (Moradi 2009). To an outside observer, it seems as though "pure glitches" and their "forced" counterparts are valued as an authentic representation and embrace of the chaos that exists in all human endeavors and that "glitch-alikes" are seen

as poser style because they are not the result of random interference or forced bends with all the uncertainty they entail, but just reference the *aesthetics* of rupture. They are like punk style without punk lifestyle.

Artist/scholar Rosa Menkman has articulated this in a different way by differentiating between "hot" and "cool" glitches. "Hot glitches" are when the aesthetics of glitch are used without any reference to the process/politics behind the glitch.

> Cool glitches are the glitches that do not just focus on a static end product, but (also) on a process, a personal exploration or a narrative element (that often reflects critically on a medium).
>
> Cool is in a constant state of flux, as in the **genre** of "cool glitch art", which finally exists as an assemblage that relies on first of all the construction, operation and content of the apparatus (the medium) and secondly the work, the writer/artist, and the interpretation by the reader and/or user (the meaning). In the end, there is "no one definition of cool" glitch art.
>
> **Rosa Menkman, "A Vernacular of File Formats," 2010**

She goes on to say that, with "hot" glitches becoming fashionable, she is just waiting for the day when the clothing retailer H&M will start selling hoodies that say "Glitchs not dead" and that she will go ahead and wear one because "fans are not as bad as the ignorant!" (ibid.).

There is a sense of continuity between film artists such as JJ Murphy and his most well known work *Print Generation* and the work of artists such as Christophe Behrens and Will Hurt (glitchCORD) who repeated digital compression or the compression that results from putting images through several different transfer processes (uploading, downloading, copying to VHS, etc.). Please be aware I AM NOT SAYING that Murphy inspired or came first or whatever; what I am saying is that Murphy was experimenting with memory and impermanence in *celluloid* and glitch artists are doing something similar in games/video/sound/digital—repeated copying (compression) makes the image/sound become abstract, indecipherable, new. Every tool in the hands of an artist begs to be broken/broken-in to make something the toolmaker never intended. In this way, although "How does this thing work?" is always an interesting question, the more compelling one is "How does this thing not work?" That is where art and science meet.

So the first thing we are going to experiment with in this chapter is data compression. What this means is that we will take an ordinary image file and by altering how it is compressed we will change how it appears. Figure 13.2 was taken with my iPhone. The iPhone has a built-in compression setting, so this isn't a raw photograph (we'll do one of those in a moment) but I thought I'd start with a tool (camera on your cellphone) that most of you already have and go from there. You can see there is already some image abstraction going

FIGURE 13.2
Mother's Day, May 2014, my three sons and their dad.

on, a lens flare (vertical light stripe on the upper right). This is an artifact of the process—a document of the conditions, a bright sunny-day photo taken facing into the sun—when this image was taken. There is also some skewing, which is distortion caused by the wide angle of the lens and the closeness of the subjects. As my computer is a Mac, I will also be using software that runs on this system, but there are corollaries in the PC world. The first thing I did was open up the photo in Photoshop and resave it as a GIF—Graphics Interchange Format (Figure 13.3). Because the format compresses a much larger palette of colors into 8 bits per pixel—from 256 colors—it produces some artifacts and blocky-ness that is kind of cool. Then I resaved the image with a bunch of different image sizes and pixel depths until the image became very pixelated (Figure 13.4).

Then I decided to do a little data manipulation. There are a number of ways to manipulate the code directly. For this example I am going to use TextEdit, Photoshop and the screen capture function on my Mac. It is also possible to do these kinds of basic code "hacks" using programs native to the IBM environment. Follow the steps below to produce a variety of "glitched" images. One proviso, as my friend Evan Meaney advises, for safe glitching always work from A COPY of an image, not the original.

FIGURE 13.3
Saving the picture as a GIF.

FIGURE 13.4
Resaved a number of times and sizes to produce extra blockiness.

For Figure 13.5, I opened the COPY of the original image in TextEdit and deleted the header. The header is the first part of the code and, while I'll confess I don't really understand code too much, it is easy to see that this header is telling me what the image was shot on (iPhone back camera 4.12mm f/2.2) but also that I opened and saved it in Photoshop CS5.1 for Mac. I then saved the image as a .raw file simply by saving it in TextEdit but changing the ending from .txt to .raw. I then opened it in Adobe Photoshop. Changing the type of file to .raw caused Photoshop to prompt me as I was opening it. I had to enter information so that Photoshop could try to "read" the file accordingly. I had to put in the pixel dimensions of the image, how many channels, the bit depth

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FIGURE 13.5
The header for the picture as seen in TextEdit.

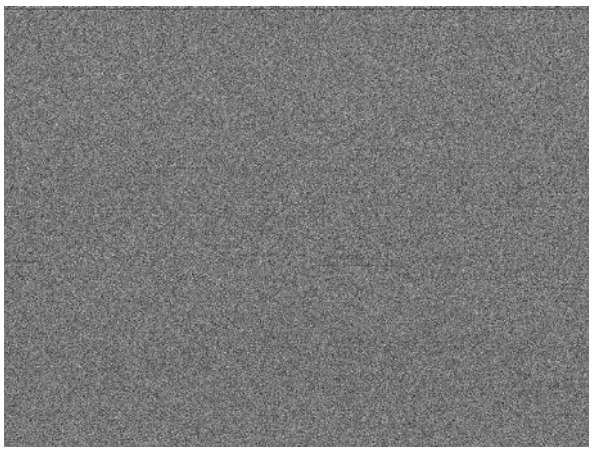


FIGURE 13.6
1600 x1200 pixels, 1 channel, 8-bit depth with a header of zero.

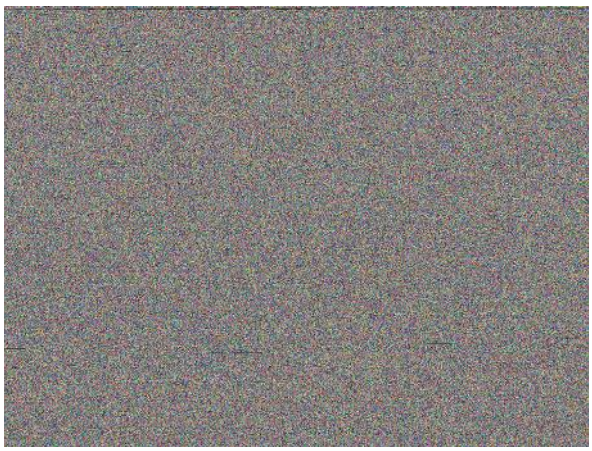
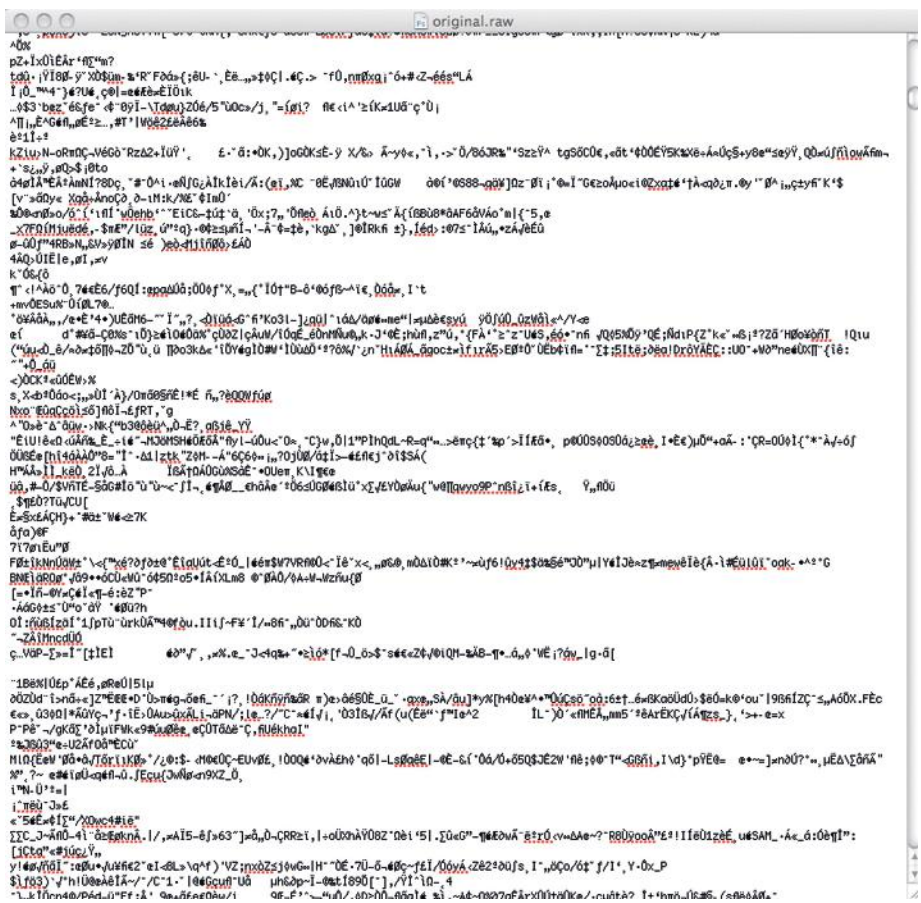


FIGURE 13.7
800 x 600 pixels, 3 channels, 8-bit depth with a header of zero.

FIGURE 13.8
A sample of the code from the image above, without editing.



and header size. Figure 13.6 is this photograph at 1600 × 1200 pixels, 1 channel, 8-bit depth with a header of zero. Figure 13.7 is this photograph saved at 800–600 pixels, 3 channels, 8-bit depth with a header of zero. As you can see, there is no image, just a bunch of pixels, black, white and gray in the first, and in various colors in the second. As interesting as these results are, I wanted to try to do a little data editing and see if I could create an image with most of the image still "intact" (legible as the original) but with some artifacts of code manipulation/removal.

In order to edit the code, you need to be able to "see" it and there are a number of ways to do this. The most simple method is to open the image document in TextEdit or a free program such as HexEdit. Figure 13.8 is a sample of the code from the image above, without editing. For this experiment I returned to my original JPEG image and opened it up as a text document in TextEdit. When I create a glitch I like to experiment with things that have some sort of connection with the image I'm manipulating. Since this is a picture from my first Mother's Day with my youngest child I decided to go through the code and change all the "4s" to "5s". Figure 13.9 is the result opened in Preview on my Mac. Although this data manipulation wasn't random, there was no way for me to predict what the result would be. Also, Figure 13.9 is how the image opened

FIGURE 13.9
The same image opened in Preview on my Mac and "saved" as a screen grab.

FIGURE 13.10
The same image opened in Photoshop and "saved" as a screen grab.

in Preview, whereas Figure 13.10 is how it opened in Photoshop. Glitches appear differently depending on the program you open the image in. In order to "preserve" a glitch I used the screen grab function on my Mac.

The more information an image has, the more you can manipulate/bend it, so next I scanned a photo from above my desk as a TIFF at 600dpi (Figure 13.11). I turned this image into a Photoshop .raw document so that I could manipulate the way Photoshop interpreted the image as it opened it. I got the idea to do this by reading Rosa Menkman's "Vernacular of File Formats" in which she goes into depth on data bending images. When you open a .raw file in Photoshop you will get a prompt that asks you to describe the attributes of the image (Figure 13.12). If you DO NOTHING to change these parameters the image will open and look exactly as it did when you scanned it. Instead I decided to change the channels to 1, with a 16-bit depth, ordered for Mac and a header of zero. The result is Figure 13.13. With Figure 13.14 all I did was deselect "interleaved" and for Figure 13.15 I swapped the height and the width.

FIGURE 13.11
A scan of the image of my oldest son as a toddler that I keep on the bulletin board above my desk. The picture has been through a lot. Notice the scrapes on it in the right-hand corner? This is evidence of its material decay.

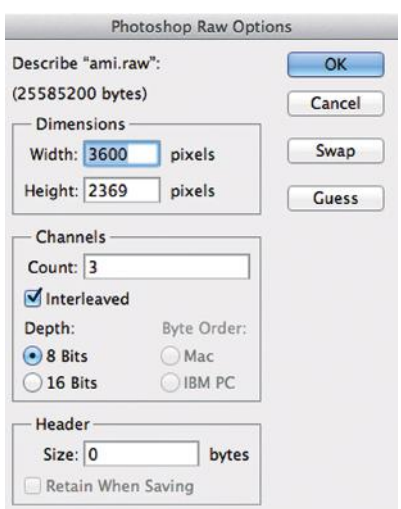


FIGURE 13.12
When you open a .raw file in Photoshop you will get a prompt that asks you to describe the attributes of the image. These are the original attributes of Figure 13.11 scanned. If you do nothing the scan will remain as is.

Figures 13.16–13.19 are various adjustments of the width to 3599, 3550, 3400 and 3200 with the height remaining consistent. As you can see, very small changes can result in big effects on the image.

FIGURE 13.13
For this version I changed the channels to 1, with a 16-bit depth, ordered for Mac and a header of zero. Making it a single channel made the image black and white.

FIGURE 13.14
Returning to my original image, the only change I made was to deselect "interleaved".

FIGURE 13.15
The only change I made was to swap the height and width numbers.

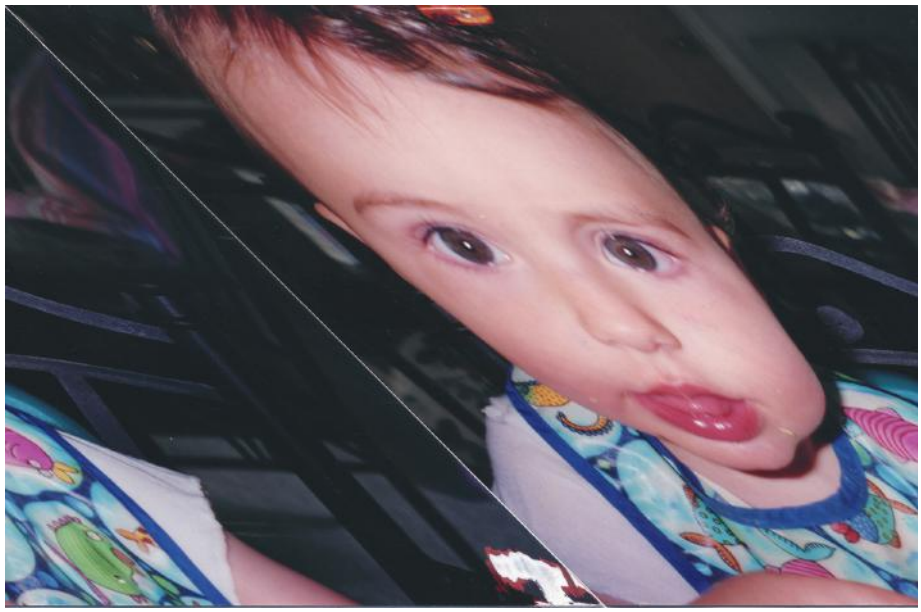


FIGURE 13.16
Leaving everything else untouched, I adjusted the width to 3599 with the height remaining consistent. As you can see, very small changes can result in big effects on the image.

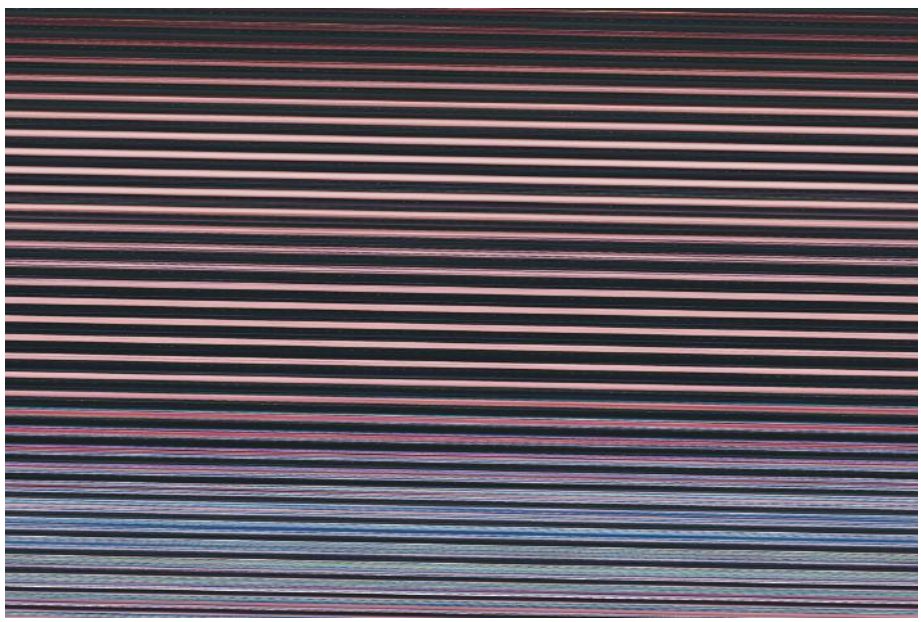


FIGURE 13.17
Leaving everything else untouched, I adjusted the width to 3550 with the height remaining consistent.

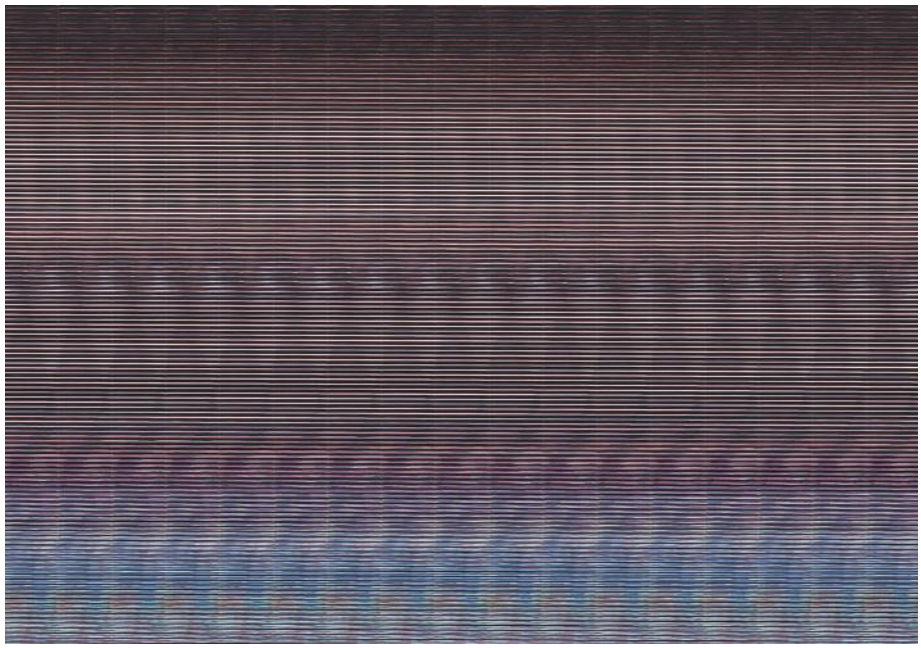


FIGURE 13.18
Leaving everything else untouched, I adjusted the width to 3400 with the height remaining consistent.

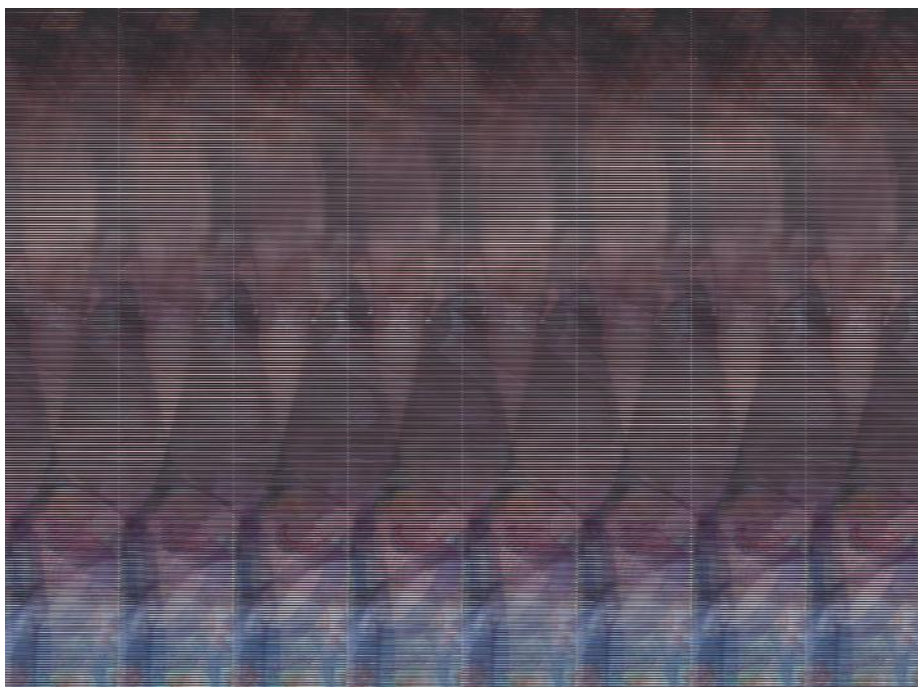


FIGURE 13.19
Leaving everything else untouched, I adjusted the width to 3200 with the height remaining consistent.

What about video? The first file I decided to change was actually a rather boring time lapse of a meteor shower (boring because it missed most of the "shower"). All I did was take the movie I had made of the time lapse and open it in TextEdit. I then scrolled to the middle and removed a single "I". That's it. Figures 13.20 and 13.21 document some of the "distress" this deletion caused. Why an "I"? I was thinking of Martin Buber, to be honest, the majesty of the celestial dome and my singular insignificance in the face of space and time. Which brings me back to Rosa Menkman and her differentiation between "hot" and "cool" glitches. It is really difficult for me to just be random with my glitchiness. With my "Mother's Day" photo, my first glitch attempt where I had to change data, I elected to change all the "4s" to "5s" because the picture was quite literally a representation of a documentation of my family changing from 4 people to 5. When I glitched the time lapse, because it was already pretty compressed, I knew that just a slight modification would probably create a big change so I simply went to the middle and thought, "What should I remove?" A single "I" seemed right. I'm not trying to get overly philosophical, but it is really impossible for me, as an artist, to be totally random. I am always driven by something, ideological, political, even when I don't really identify it in the moment. My work, especially my work in which I celebrate "distress" (hand-processing, bleaching, scratching and now glitching), seems to be deeply rooted in *making meaning* NOT just pretty pictures. Even if I'm a novice at something (like I am at glitch), and even if this makes me sound like a dork, making meaning and figuring out *what impact I intend* a work of art to have is essential. Nothing is meaningless. Even meaninglessness.

Speaking of novices. I showed my kids these images and they were very interested in trying themselves. Figures 13.22 and 13.23 are data bends by my oldest sons, Ami and Zev, made during bedtime stories on May 19, 2014.

As interesting as these results are, I wanted to try to do a little data editing and see if I could create an image with most of the image still "intact" (legible as the original) but with some artifacts of code manipulation/removal. As demonstrated in the glitch experiment above, in order to edit the code you need to be able to "see" it and there are a number of ways to do this. The most simple method is to open the image document in TextEdit or a free program such as HexEdit. TextEdit will translate your image into the computer language ASCII (American Standard Code for Information Interchange), which encodes in 128 characters including numbers, upper- and lower-case letters, and various punctuation symbols. HexEdit uses hexadecimal code, which has sixteen symbols, 0–9 to represent values zero to nine and the letters A, B, C, D, E and F to represent values ten to fifteen, and is written as a human-friendly (read shortcut) way to represent binary code (0s and 1s) in that the values in the range 0 to 255 can be more easily represented in hexadecimal code as 00 to FF. In order to get a sense of the way these codes are different, I can write my name in ASCII as Kathryn, in hex code it would be 4B 61 74 68 72 79 6E and in binary it would be 01001011 01100001 01110100 01101000 01110010 01111001 01101110. Playing around with how these codes are different is

FIGURE 13.20
Distress caused from removing a single "I" from the middle of a compressed video. There is glitching at the bottom of the frame.

FIGURE 13.21
Distress caused from removing a single "I" from the middle of a compressed video. The image of the video goes completely green.

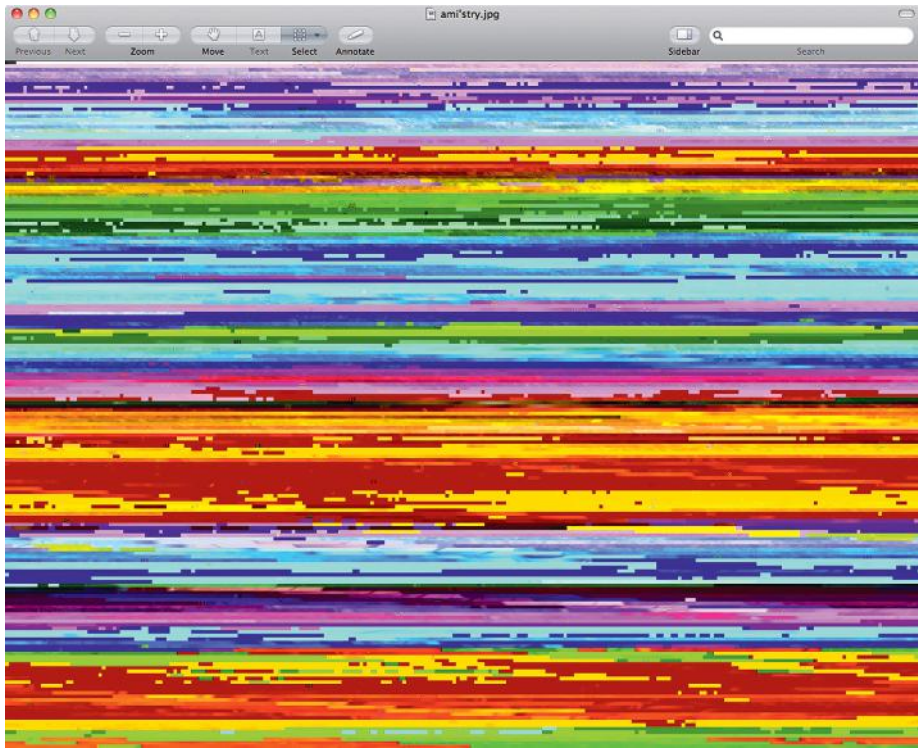


FIGURE 13.22
Amiel took a rather unflattering photo of me, opened it in TextEdit and using FIND/REPLACE changed all the "e" to "@" (over 7000 changes), saved the image as a JPEG and opened it in Preview where I took a screen shot to "preserve" the glitch.

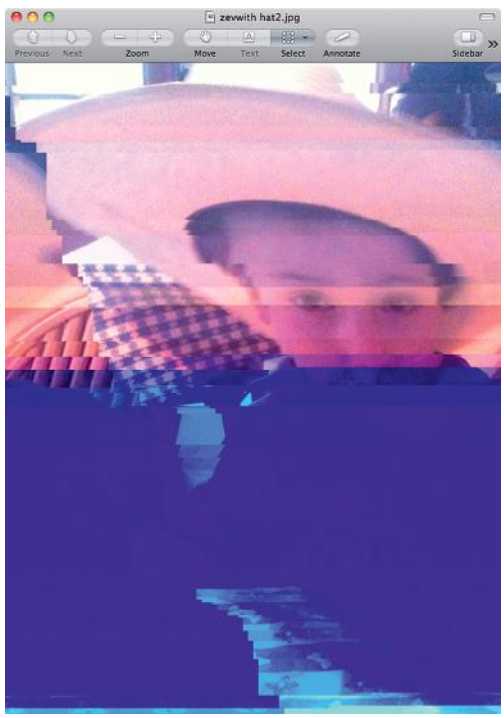


FIGURE 13.23
Zev took a photo of himself wearing his dad's cowboy hat, opened it in TextEdit and using FIND/REPLACE changed all the "A3" to "3A" (nineteen changes). This only produced a slight glitch so he continued and changed all the "Z7" to "7Z" (fifty + changes). He saved the file as a JPEG and opened it in Preview where I took a screen shot to "preserve" the glitch.

pretty fascinating. A man named Paul Schou created a web-based translator that you can access at: http://paulschou.com/tools/xlate/.

Although I've spent the last several pages explaining in prose how I glitched various images, in keeping with the structure and format of this book I will lay it out in a bullet list format. However, I want to be sure that you understand that there is a vast array of ways to glitch data and these are just a few easy processes to get you started.

WHAT YOU WILL NEED TO GLITCH (DATA)

- A computer (I honestly haven't tried to perform glitch on my phone or on an iPad but I'm sure you could).
- Images/sounds/movies in a variety of digital formats to experiment with.
- A way to edit the code—I used TextEdit in the examples but my friend Evan Meaney really likes the freeware HexEdit. Both are great and there is more about what makes them different below.
- A way to preserve glitches that you like. Screen grab or Screen record in QuickTime works great.
- Electricity.

Since glitch can be done a multitude of ways and is really about experimentation, I thought the best way to encourage you, dear reader, would be to work step-by-step through some glitching of an image, a sound and a video. For the image I am going to use the TextEdit/Photoshop .raw method; for the sound and video I am going to use HexEdit. Whereas TextEdit is made to edit the text of any file and comes free on all Apple computers, HexEdit is an Open Source file editor. Open Source means that it is free to download and that you can download the source code and alter it to suit your needs. Often users who modify Open Source software send their modifications back out into the community of users so that all can benefit. A file editor allows you to view and edit the data contained within any file. The most recent version of HexEdit, 2.20 as of this writing, allows you to edit in hexadecimal, decimal and ASCII code, and can be downloaded for free at: http://sourceforge.net/projects/hexedit/.

STEP-BY-STEP OVERVIEW OF A COUPLE OF GLITCHES

Image

For the process of glitching a still image, I am going to work with a slide of my Dad from his time serving in the Army. First following Rosa Menkman's "Vernacular of File Formats," I'm going to work through various means of data

compression/manipulation by opening the file as a Photoshop .raw and changing the options as presented. Following that I will save the file in different formats. Figure 13.24 is the scanned slide. What follows is a step-by-step guide to the work that I did complete, with screen shots of the steps as I'm doing them and images of the results.

- If a file is not already designated as a .raw file, change the suffix to .raw.
- Open the file in Photoshop. Figure 13.25 is the dialog box in Photoshop when I open it as a .raw file. If I do nothing to this box, the file opens and looks "normal".
- Change the number of channels. Figure 13.26 results simply by changing the channels on my picture from 3 to 2.
- Change the bit depth. Figure 13.27 results by keeping the channels constant and changing the bit depth from 16-bit to 8-bit.
- Uncheck the "interleave" box. Figure 13.28 results when the box for "interleave" is left unchecked.
- Change the width of the image. Figure 13.29 is the result when I changed the width to 3349 (from 3351).
- Combine one or more of these techniques. Figure 13.30 resulted from opening the file, deselecting "interleave" and changing the width by one pixel.

FIGURE 13.24
A slide of my dad in the Army.

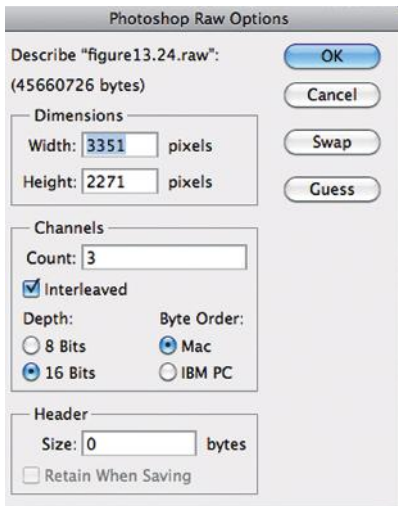


FIGURE 13.25
The Photoshop raw options panel for this slide.

FIGURE 13.26
The result simply by changing the channels on my picture from 3 to 2.

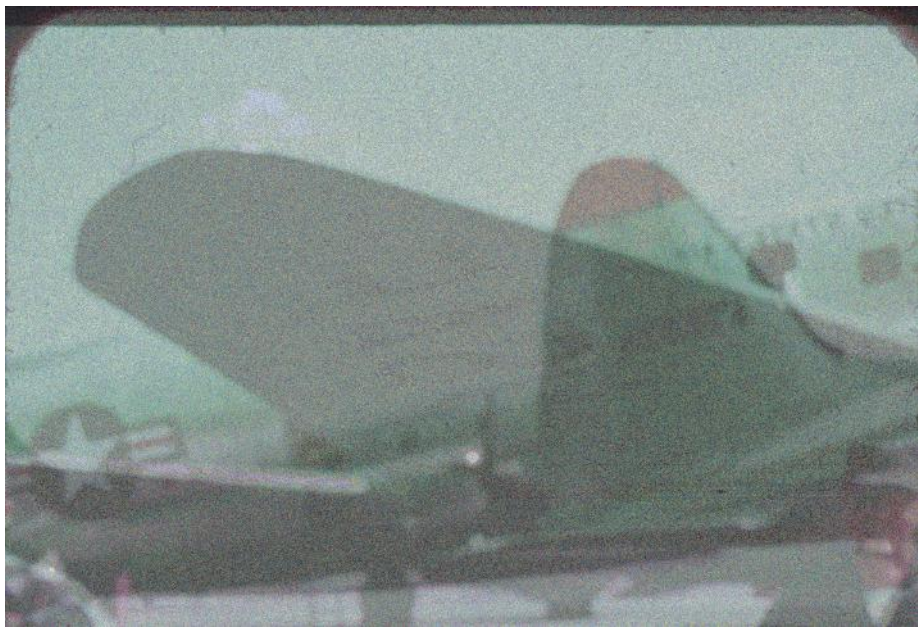


FIGURE 13.27
The results by keeping the channels constant and changing the bit depth from 16-bit to 8-bit.

FIGURE 13.28
The result when the box for “interleave” is left unchecked.

FIGURE 13.29
The result when I changed the width to 3349 (from 3351).

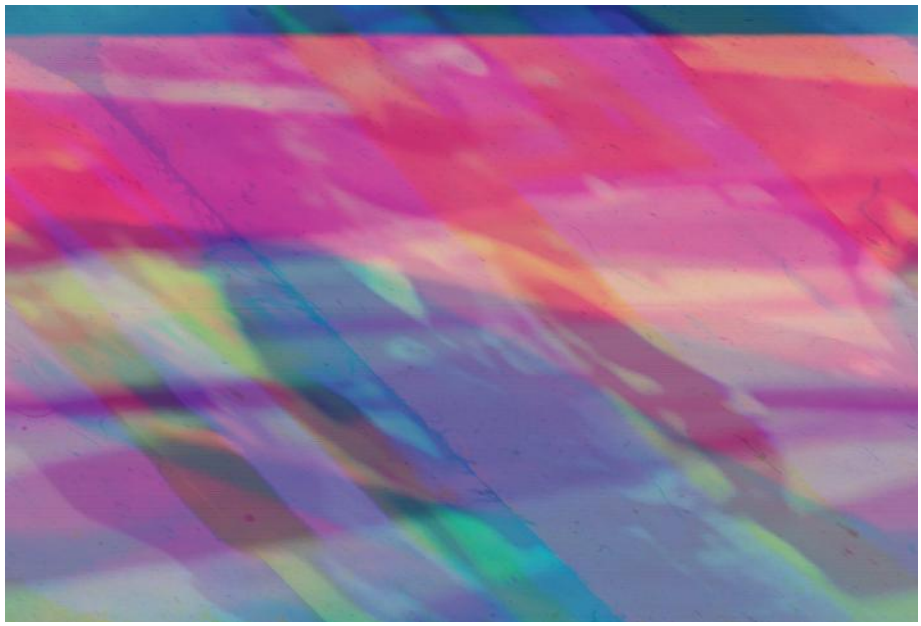


FIGURE 13.30
The result from opening the file, deselecting "interleave" and changing the width by 1 pixel.

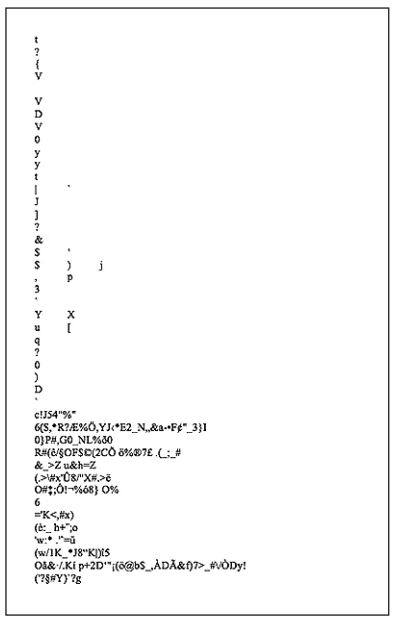


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FIGURE 13.31
The first page of this image opened in TextEdit.

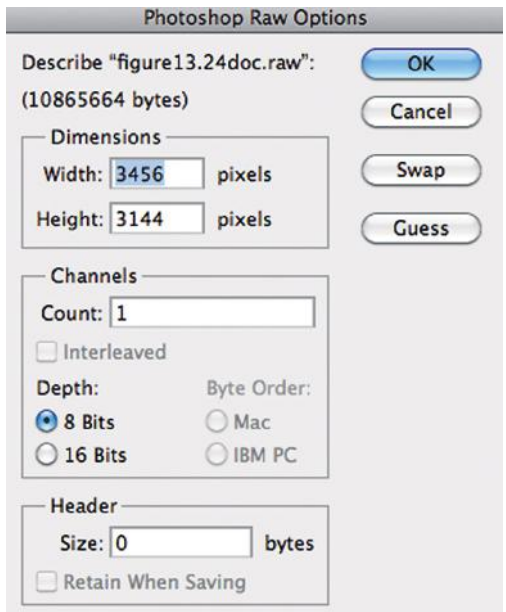

FIGURE 13.32
The automatic settings that came up on my dialog box upon opening.

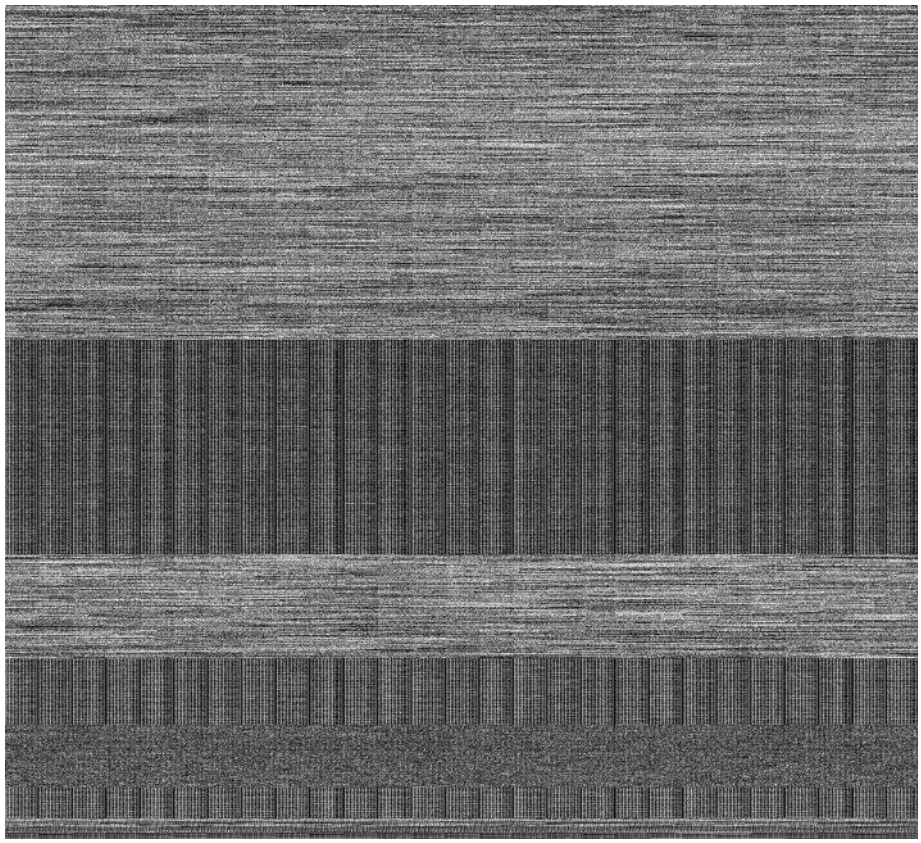

FIGURE 13.33
What the image looked like when opened in Photoshop after going through TextEdit.

Another way to manipulate data is to open it in a non-image program or to save it as a different kind of file. In Microsoft Word you can ask it to find text in any file. I opened a copy of my original image this way. It is 4887 pages! Figure 13.31 is the first page. I saved it as a .doc and then changed the ending to .raw and opened it in Photoshop. Figure 13.32 is the automatic settings that came up on my dialog box upon opening. Figure 13.33 is what the image looked like. Figure 13.34 is what happened when I tried to adhere to the original settings for the image in terms of height/width relationship, channels and bit depth. Figure 13.35 resulted in saving the original file as a Portable Bit Map (.pbm), then opening that file as text in TextEdit and then moving big (as in paragraph size) chunks of code around until I was satisfied with the results. These examples are just the tip of the iceberg in terms of what you can do when transferring image data between file types. The individuals who came up with these bends did so by trial and error, and I recommend you do the same. But remember, if you care about your original image, save a copy before you bend!

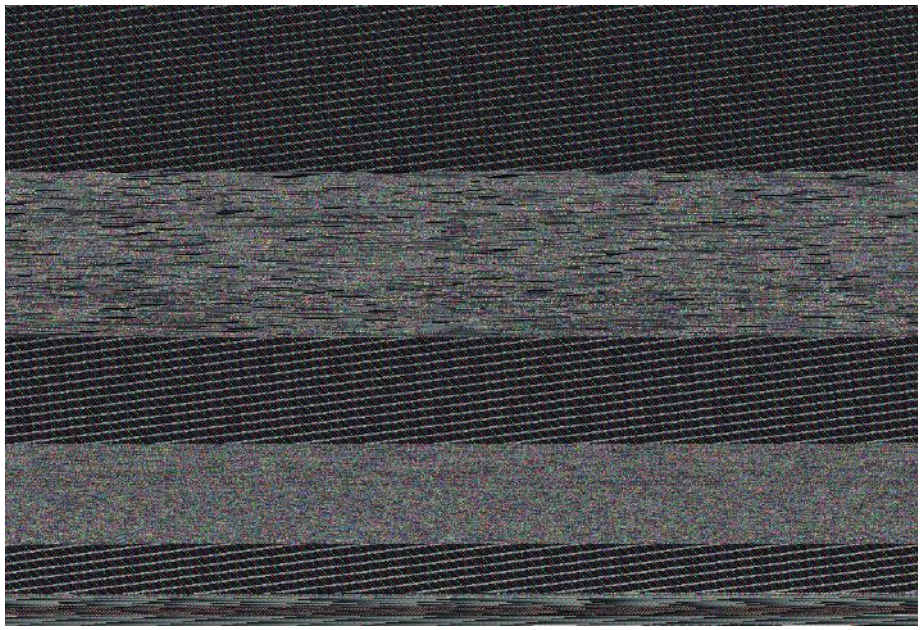

FIGURE 13.34
What happened when I changed the settings in the Photoshop dialog box to the original image settings.

FIGURE 13.35
The result from saving the original file as a Portable Bit Map (.pbm), then opening that file as text in TextEdit and then moving big (as in paragraph size) chunks of code around until I was satisfied with the results.

Movie

I will illustrate the process of working with .mov files in HexEdit through screen grabs taken during the process. As with the image, in order to "preserve" a glitch that you like it is often necessary to use the screen grab function (on Macs command + shift + 3 for a screen shot OR command + shift + 4 to crop the screen) of the glitch opened the way that you want to preserve it. Glitched videos can be recorded off the screen via QuickTime and, similar to screen grabs, you can just record the whole screen or a cropped section.

The first thing I did was to open a .mov of one of my films in QuickTime and select a section using the trim function (command + T will create a yellow rectangle around the timeline at the bottom of the screen; you adjust the in/out by moving the left and right edges of this rectangle with your cursor). I selected a time lapse section of fireworks and saved it as its own file. As when working with an image or sound, YOU MUST SAVE A COPY of a file you are glitching and then SAVE VERSIONS AS YOU WORK because HEXEDITING IS OFTEN IRREVERSIBLE. In other words, you can totally mess up/ruin your files.

STEP-BY-STEP .MOV GLITCH

- Find or create a short clip of .mov to work with.
- Make a copy and save it in a new folder where you will save your glitch work moving forward.
- Open the file in HexEdit. When I opened this file there was a dialog box that offered the option of opening the data or resource fork or for the program to automatically choose. When I selected resource, I got this dialog box (Figure13.36) indicating that my file had no resource fork, but I could make one. Figure 13.37 shows what the panel looks like when I opened it on auto. This is all the data in the file presented in hexadecimal and ASCII code. The central portion of the panel in Figure13.37 is hexadecimal code. The right-hand side is ASCII. It is best to alter just a bit of code at a time and see what impact it has. The first thing I did was go into the ASCII area on line 000003C0 and add my name—Kathryn. In Figure 13.38 you can see that altering the ASCII code also altered the hex code. This small change made it so that the .mov wouldn't open in QuickTime or in VLC. I tried a number of other quirky edits. Some produced no noticeable results, whereas others (most of them) caused the video to simply stop playing at (I presume) the point where I made a change or to refuse to open altogether. Finally on my sixth or seventh try I simply used the Find and Replace function, substituting 72, 65 (r, e) for every instance of 66, 69 (f, I). This produced a very nicely glitched video (WEST_Hex_Edit5.mov), which can be seen online. Figure 13.39 shows a frame of this video.
- I then continued to bend this video by substituting 72, 6B (r, k) for 77, 6F (w, o). This resulted in further glitching, which can be seen online

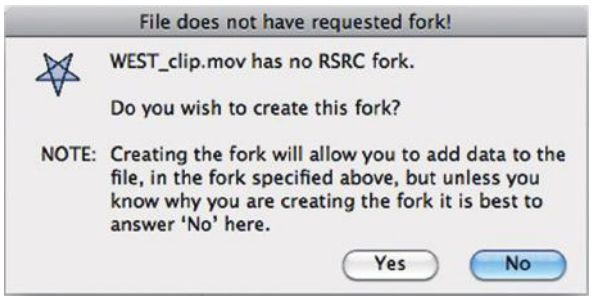
File does not have requested fork!
WEST_clip.mov has no RSRC fork.
Do you wish to create this fork?
NOTE: Creating the fork will allow you to add data to the file, in the fork specified above, but unless you know why you are creating the fork it is best to answer 'No' here.
Yes
No

FIGURE 13.36
When I selected resource, this dialog box indicated that my file had no resource fork, but I could make one.

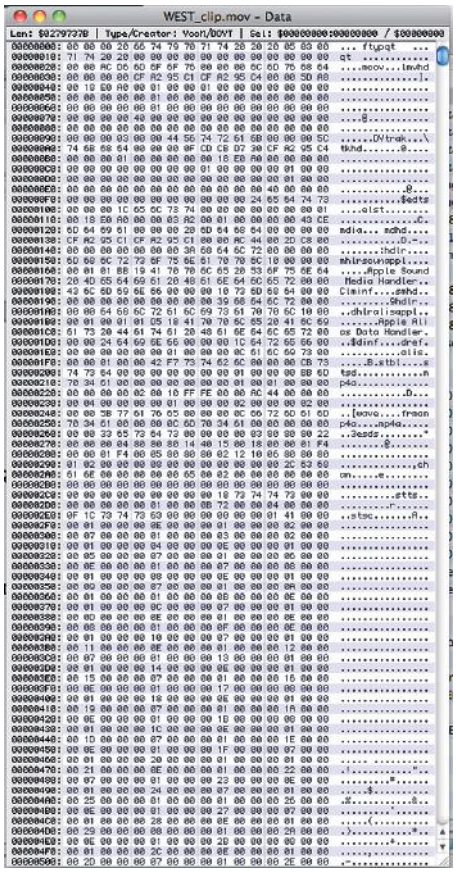

FIGURE 13.37
What the panel looks like when I opened it on auto. This is all the data in the file presented in hexadecimal and ASCII code. The central portion of the panel is hexadecimal code.

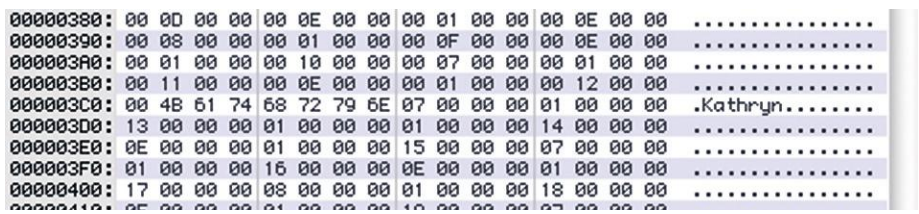

FIGURE 13.38
I insert my name into the ASCII code.

(WEST_Hex_Edit6.mov), and is represented in this still (Figure13.40). My final glitch on this video was to substitute 65, 6D (e, m) for 6B, 72 (k, r). The video continues to play with further glitches and can be seen online as WEST_Hex_Edit7.mov.

FIGURE 13.39
Using the find and replace function, substituting 72, 65 (r, e) for every instance of 66, 69 produced a very nicely glitched video.

FIGURE 13.40
I then continued to bend this video by substituting 72, 6b (r, k) for 77, 6f (w, o). This resulted in further glitching.

SUMMATION

Writing this chapter has been a genuine experiment for me. Most of this book engages with experimental practices that I have been using in my own work or at the very least teaching for over a decade. But in the case of glitch/data bending, as I said at the beginning, I am a true novice, no matter my enthusiasm. If it weren't for Evan Meaney, I probably wouldn't have included digital manipulation and yet I hope that you see (as I do) how clearly data bending fits in with all the other methods of media manipulation presented in this tome. It is fitting that we end with the newest, youngest voice in this group, the voice closest in age to my students and to you my imagined reader. I hope that my talk with Evan Meaney inspires you as much as it does me to go forth into unknown (at least to you) waters and experiment.

INTERVIEW WITH EVAN MEANEY

Kathryn Ramey: So—a general question to get the grease flowing—do you consider yourself an artist, a filmmaker, a new media practitioner, a shaman, a performer? How do you describe who you are/what you do to your aunt or the old guy next door? Or children? Yourself? Your friends? Or do you even try?

Evan Meaney: This is a good one. I used to say I was a scientist. Then I met some real scientists and felt like I couldn't justifiably co-opt that term any more. When asked in a public setting, I'll typically say I'm a professor (since I think that raises fewer eyebrows and has the added benefit of being true). New media practitioner, which has certainly been making the taxonomical rounds, seems too vague to me. Probably because "new media" is such a lackluster term and "practitioner" makes it seem like I'm going to administer an inoculation. When I'm being honest, or when I'm trying to describe what I do for people who want more than a one-word answer, I usually say I use computers to make communication items that other people describe as art. These items try to thoughtfully bridge the gap between the human and their interfaces by recognizing that the gap will never be fully bridged. My neighbors believe I make video games (again, not untrue) and my father thinks this is all a cover and that I work for the CIA.

KR: How did you come to your particular practice? Did you develop your own processes as a series of experiments? Where did the ideas come from? Does your form and method change as you go and, if so, where have you been and where are you going?

EM: I started doing this kind of dirty new media in college. Most of my professors were looking to concretize celluloid media as an object. They would hack and burn the film frame with alternative chemical/natural/photographic processes and the results would be projected (beautifully, I might add). I like that other people love film, but it never hit me like it was supposed to. I was more of a hard-drive, random-access, video game mod, pixels kind of student. I spent most of my time on a computer anyway, so I might as well make art there.

The glitch work first started as planned mistakes and then evolved as I began to have more control over the outcomes. Just because something has been made to glitch doesn't mean it has value. For me, breaking the image was easier than developing the contexts in which an unstable JPEG would have meaning (to me and to others). As this process grew, as I went to graduate school, as I started listening to more feedback, and as I met other like-minded artists, my own work methods began to change because I had a larger vocabulary from which to draw the questions my videos and installations posed. Once I established some technical competency in this kind of practice (a relatively small investment) the bulk of the evolution has been conceptual. Yes, I learn new tactics for each new project, but those are a means to an end. They are merit badges. The context is where I place my value.

Where have I been, where am I going? I don't really know. I have been to a place where I thought glitches were analogously redemptive. Where they offered a type of communion between the textual undercurrent of the machine (binary) and the textual undercurrent of me (DNA). I really liked that metaphor. I still do. But I think there's another part to it. Once the body has been connected to the file/machine/archive through metaphor, what do we do with that hybrid? What other hybrids can be addressed?

KR: What do you mean by "analogously redemptive"? Why kind of hybrids are you exploring now? Thinking sort of philosophically, aren't we all already part-machine? Haven't we been for centuries? If yes, why is it important for you (as someone making communicative acts) to self-consciously "think through" the MACHINE (I mean that to include all non-biological tools that you use)?

EM: I think this is more in line with my personal artistic beliefs than with the universal beliefs of the body artistic, but I find that nobody, totally content with their existence, will produce anything of value. My practice is about working *through* something, not necessarily *towards* something. The interconnection between textuality, organism and digital systems is, in itself, informative. The sub-components inform one another. The summation informs the external. Donna Haraway writes more cogently on this subject than I could ever hope to. Yes, we have been cyborgs ever since we adopted the first technology (language)—cyborgs ever since we could communicate. However, it wasn't until the late 19th century that we began to consider technology as we do today. Only after we recognized technological enhancement as foreign could we realize it's actually intrinsic. To think through a machine is to think through the machine's interconnections—to think through ourselves, through a contrast.

KR: What role does media/technology/tools play in your work? What is the relationship between the media/tools and what your work is about? Is your work about something(s)?

EM: Technology is another kind of vocabulary. Its elements offer my work systemic suggestions. Photoshop has a set of limitations and capabilities. As do I. Out of those obstructions, new kinds of work are created and they are

inherently collaborative. I am distrustful of artists who claim they can bend a medium to their will. I fear they have missed the point.

I feel like I may have answered the second and third part of this question already, but I will try to offer something in a different way. My work is just that. It's the proof of an active process of conceptual development. It is my hope that such a proof prompts others to engage in their own mental work, but their actions are out of my hands. I can only really relay a question I found value in and my subsequent findings as best I can. The rest is left to hope.

KR: Why is your hope that "others engage in their own mental work"? Why is this important to YOU? What good will this work do you, the world?

EM: Don't we all hope that our audiences will internalize some of our artwork and subsequently synthesize that input with their own experiences? That internal production, for me, is the union between author and audience. I supply the flour, but the cake is made in their oven. I suppose this is important for me because the strongest connections are the ones we make ourselves. If I really want to say something pedagogically meaningful, shouldn't I try to get others to say it with their own voices?

KR: Where do you show your work? How do you want people to experience it? Is there a relationship between the form that your work takes and your desired venue/audience?

EM: I show my work in film festivals and galleries and installation spaces. I hold workshops at artist collectives and universities. Have laptop, will travel. I feel like, in the digital age, there is no optimal viewing space, or, rather, no place for me to tell others where they will have the best experience. If people want to Vimeo my work and watch it on a phone, great. If they want to head to a film festival and see it with a community of peers, wonderful. An audience member watching my work is trusting me not to waste their time. I trust them to engage as they see fit—even if that means disengagement.

As for form—yes, the form of my work can modify where it plays and therefore who sees it and how, but I've tried to make my artwork somewhat modular to combat this authorial specificity. For example, one of the installations in the *Ceibas Cycle* is twenty-seven channels video. Although I have shown it as a twenty-seven-channel installation (and very much liked it that way), I have also shown it as a one channel and several stops in between. Each configuration has its own charm and I find new things in the work every time it's reconfigured. Again, the authorship is somewhere between me and circumstance, never in either camp fully.

KR: Your openness to the variety of possibilities for screening/audiences is both a ceding of the kinds of power artists/filmmakers have traditionally tried to afford themselves (the ideal space) and an embracing of how (potentially non-ideal/different) spaces/viewing experiences can make the work in a new way. Is this freeing? Does it influence how you make work? Would you even be able to tell?

EM : Not to be coy, but I think you're right. I wouldn't be able to tell. I have reasons which I could list, but those are mostly hindsight justifications. I respect artists who take a lot of care in defining the user's experience, it shows they have put a good deal of thought into their artwork and are passionate about it. I try to be less passionate about the artwork than I am about the audience's interception of it. These elements are certainly connected, but not the same. For example, right now I'm working on a new project with lots of archival audio elements. I have spent hundreds of hours listening to this stuff. It's brilliant in a lot of very functional ways—lots of small moments of intrigue. I wish I could just throw the lot out into the public sphere and implore the audience to listen, because I find it all-important. Such an act would show fidelity to the material. However, I'm editing it all down—way down—giving the audience the start of a story that they can then finish on their own.

KR: And finally, this chapter is about GLITCH! Please elaborate how you came to glitching, glitcha, glitcherati? Are you part of a community of makers (either locally or internationally) who communicate with each other about their work and get together either virtually or physically to discuss/show/celebrate? Where? When? How? What happens?

EM: Oh man. This is a big one. In 2006, I thought I had invented glitch-art all by myself in an apartment in Ithaca, New York. I was, of course, wrong, but I had yet to find the online presences that would come to shape my future. Jon Cates found some of my work and put it up on his blog. Christy LeMaster programmed the *Ceibas Cycle* at her space in Chicago. This introduced me to the thriving dirty new media scene there. I met Jon Satrom and Nick Briz, both of whom (along with Rosa Menkmen) would found the GLI.TC/H event with me. Syntactically, that makes it seem like I was a driving force, which I wasn't. It was a group effort. Actually more than just that core group. People flew in from all over, artists sent work, JODI Skyped in. It was a firestorm that contextualized all of these throughout-traces that I had been having for years. For the most part, we all still stay in touch. Rosa's book came out and we all read it. Facebook comments and likes reinforce a somewhat distributed collective. Distributed works for us because glitch-art is really a modifier, not a movement. Rosa, Jon, Nick and I all have such radically different art practices, goals, loves and so on that cohesion isn't the ideal. Which make sense. The spirit of glitch art is the spirit of incongruence of expectation.

KR: OK, but what has finding these people, founding this "community", however dispersed/non-geographically centralized meant to you?

EM: A few things. On one level, finding a community of peers was great because it meant that I wasn't too crazy. I found all of this glitch stuff really interesting and to meet other glitch-kids meant that it wasn't too obscure a niche to keep exploring. Secondly, and perhaps more practically, it meant that there was just *more work* out there to see and experience and play around with. More work means more ideas. More ideas means better work. Being part of a nascent art community is rewarding because changes are quick. From 2009 to 2012, there

was something really new and different happening in the glitch-world every few weeks. The internet kept it immediate and allowed people to trace glitch lineages. YouTube video tutorials and home-brew software led to different aesthetic phylums. In a sense, the glitch movement was a rapid evolution, one that survived on a development of tools and technical learning. Now that glitch-art (especially software-based glitches) has become more established, more people are migrating over to the conceptual elements of the practice. I, as you might imagine, am all for this.

Evan Meany's assignment—glitch self-portrait

1. Take a selfie.
2. Load it onto a computer.
3. Using the hexadecimal data-bending tutorial in this book, glitch your image.
4. If done properly, your image will distort dramatically.
5. Realize that a similar distortion will happen to your body over time.
6. Note that systems are only recognizable in so far as they are imperfect.
7. Feel unified in this temporary expression of cyber-organized mortality.
8. Do not save your image.

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Conclusion

Imaginary community/ virtual communitas

I read somewhere the other day, in an interview with Clifford Geertz (great 20th-century anthropologist), that he didn't write drafts. He said that he sat down and wrote his books from the beginning to the end and that he rarely edited. This gave me heart, because, in truth, this book has gone best when I forged ahead. When I labored over a passage here and there or went back to edit, I descended into uncertainty. I worried as all but the most self-assured or narcissistic worry that I would disappoint all those who have helped me or that the work would reveal me to be stupid, ignorant or foolhardy. I don't think this is why Geertz didn't rewrite. He seemed to be saying that the act of writing was formative, transformative and sure. There is an aspect of that here as well.

This book took me forever to write, but it has come together best in the last year of the five years of my contract. That is because I have reached out to the various artists represented in these pages and they have responded to me with great willingness and generosity. The kindness and enthusiasm for this project they have shown at once makes me bashful and gives me courage. I am part of a strong and vibrant and (in contrast to the predictions of many) growing community of people who make things with their hands to share with other people. Some of them share over the web. These days that is the easiest way to stay connected.

But most of us, even if it is once or twice a year, get ourselves to this or that screening or festival and that is when the magic happens. That is where we engage in our posturing and our rituals, and where we feed each other the nourishment that it takes to get on with our day-to-day lives where we are subjects, some of us princes or even kings, in a world that only the people who live in it know or care exists. One of the main questions I asked almost everyone in this book is "What do you call yourself, what you do, how do you explain yourself?" Without fail, individuals admitted, this language is difficult, there aren't words, I say I'm a professor, I say I'm an artist.

This book, as I probably noted in the introduction, is a thinly veiled ethnography in the sense that it springs from interviews and participant observation and

field writing conducted over half my life in the community of which I am a part. In some of my first published writings (Ramey 2002) a reviewer commented about my dispassion in regards to the motivations of avant-garde filmmakers. "But what of love?" she/he said "The passion to do the work?" I responded that love was a difficult thing to theorize but this was an evasion on my part. I was just not ready to admit that I was just as foolish as every other fool who makes this kind of work. It is economically irrational, no one cares about it, people call those of us who use film at best nostalgic, at worst neo-liberal apologists (or something like that).

But there really is something there, something ineffable and yet concrete in the sense that it connects us and encourages us to keep making work and to help each other and to celebrate each other's triumphs. The title of this conclusion is drawn from two different anthropologists. On the one hand you have the ideas put forward by Benedict Anderson of imagined communities. These are communities that exist via media and other communicative acts, and maintain their cohesion through these long-distance social links in a diaspora. In his book he was talking specifically about how the idea of nationhood was constructed amongst members of a group who did not have face-to-face interaction but participated in similar communication networks and consumed similar media. Edward Said would go on to make use of this concept when he discussed *imagined geographies*: the perceived notion of a place based on discourse.

FIGURE 14.1
Mono No Aware filmmaking field trip to Black Maria, Thomas Edison workshop in New Jersey. Courtesy of Mono No Aware and Kyle Corea (photographer).

FIGURE 14.2
Double Negative Collectif, Montreal, Canada. A collage of their workspace. Courtesy of the Collectif and Daïchi Saïto.

The experimental film community has this sense of connectedness. Through various listservs and web rings and community-based organizations and festivals and screening series, we somehow maintain a kind of unruly organization. There are internecine battles (what family doesn't fight?) but these struggles only seem to prove in retrospect how seriously we all take it, how much we are willing to put forward to remain a part. And despite forays into the art world by various social actors or the art world attempting to commodify the work of individuals and despite the commercial media industry constantly forging ahead with the next better best highest resolution digital 4D what not, people somehow still seem to think it's worthwhile to come together and make work in a material format. And thanks to home-grown community-based organizations like Mono No Aware in Brooklyn, Double Negative in Montreal or L'Etna and L'Abominable in Paris or other microcinemas, artist-run labs and arts organizations worldwide, new filmmakers are being made everyday. New people are becoming interested. And this leads to the idea of communitas.

Communitas is a word that anthropologist Victor Turner borrowed from Latin to describe the sense of togetherness that arises in response to a shared or similar sense of liminality or in-betweenness. Turner spoke about it in relationship to specific non-Western ritual experiences, but his wife, Edith, also an anthropologist, has broadened the scope. She describes communitas as flow, a linking of intent, a willingness or openness in perception. When we artists come together and watch each other's work and say that it has value beyond what a market might give, or its ability to transmit a specific idea or thought or emotion, when we "get" each other's work, then we have communitas.

Communitas happens in person and it also happens virtually as we remain connected through social media and the web. People who have never physically met, consider each other friends, even influence each other's work in a formative way. This communication on and around and about work serves to inspire artists to continue to create even when those most physically proximate to them have less of a connection to their art world.

FIGURE 14.3
Mono No Aware Festival 2013. Courtesy of Mono No Aware and Sean Hanley (photographer).

For me this book is like a chain letter or exquisite corpse. I have collected the rituals and the practices and the words of my friends and colleagues. They have generously given me their time and their images so that I could make something to share with the world. Perhaps there is self-interest there for all of us. But for each person in this book what shines through is the idea that this thing, the art practice, this experimental film, is *worth* doing. Even though it is difficult to explain to people who aren't also makers, even though people, parents, loved ones, might not be able to see its value, the contributors in this book do. And they want you to as well. Make something. Share it with the world. Form a community. It may be dreamy or foolhardy to find such joy in a world so full of misery, but for many of us it seems the only way.

I still don't know how to theorize love, but I know all the people in this book feel great passion for what they do. They experience joy at making it and more at sharing it. And so do I. Here's hoping the editors grant me a 2nd edition and your work is in it!

All the best,
Kathryn

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